ARMY AIR FORCES HISTORICAL STUDIES: No. 44

UNCLASSIFIED

EVOLUTION

of the

LIAISON-TYPE AIRPLANE

1917 - 1944

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
APR 1946		**00-00-1946 to 00-00-1946**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Evolution of the Liaison-Type Airplane 1917-1944	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Air Force Historical Reserch Agency (AFHRA),600 Chennault Circle,Maxwell AFB,AL,36112-6424**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**Same as Report (SAR)**	**153**	

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EVOLUTION OF THE LIAISON-TYPE AIRPLANE
1917-1944

The original of this monograph and the documents from which it was written are in the [illegible] Division, Archives Branch, Bldg. 914, [illegible] Air Force Base, Alabama.

AAF Historical Office
Headquarters, Army Air Forces
April 1946

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F O R E W O R D

This study of the liaison airplane, which was written in the Air Technical Service Command Historical Office by Capt. Irving B. Holley, Jr., is one of a series dealing with such types of aircraft as the cargo airplane, medium bomber, and heavy bomber.

The history is focused primarily on the evolution of the idea of the liaison airplane as distinguished from the observation airplane, and emphasis is placed on the problems of isolating and identifying the growth of this concept rather than on the liaison airplane as a continuous engineering development. Engineering details are discussed only when they were factors that influenced and delimited the evolution of the concept. In short, the history is concerned with the gradual emergence of a clear understanding of specific tactical functions for the liaison airplane. When this had been gained, it was possible to establish engineering objectives.

Readers familiar with the subject matter are invited to furnish the AAF Historical Office with criticisms, additional facts, or interpretations. For this purpose, perforated sheets have been inserted at the back of the study.

C O N T E N T S

ILLUSTRATIONS

Evolution of the Liaison-Type Airplane, 1917-1944

Chapter I

HERITAGE OF WORLD WAR I, 1918-1929

The history of observation aircraft dates back to the earliest use of aviation in warfare. Although the use of aircraft in aerial combat and as bombers was foreshadowed, almost all aerial activity prior to 1915 came under the general heading of observation. In the great French offensive of that autumn, aircraft were used both for liaison with infantry and observation for command. With the publication of the manual Liaison for all Arms in December 1916, after six months of intensified practical experience at Verdun, the French embodied in official doctrine the lessons learned in combat. In the United States this document, translated and revised, became the foundation of official Air Service doctrine regarding air-ground cooperation and liaison.[1]

In the last years of World War I the function of aviation was generally considered to fall into three broad categories: activities against hostile air action, activities against hostile ground forces and ground installations, and activities in conjunction with friendly ground forces, the last usually referred to as observation aviation.

The functions of observation aviation included aerial reconnaissance over tactical areas, artillery fire control, aerial photography in hostile areas, contact-patrol flights with infantry units to keep commanders informed of positions held by advancing or retiring troops during a period

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1. Air Service Tactical School course outline, "Observation," 1924-1925, in AF Tech. Data Lib., 053.223/9, Obsn.

of movement, and the rapid transportation of staff officers, messages, and the like, for liaison purposes. At the close of the war the technical services visualized a single observation airplane which could perform all these functions.[2]

Lt. Col. T. H. Bane, who was to play an active role in McCook Field's postwar development, suggested in January 1918 that the ideal observation airplane should be "quick enough and agile enough so as not to fall an easy prey to hostile pursuit" and should have a low landing speed, "for it will often be turned over to young and imperfectly trained pilots." Colonel Bane even went so far as to picture observers protected with "a buckler on the chest and back" against the effects of enemy ground fire. Apparently the Air Service sought an observation airplane with a high rate of climb, a fast, maneuverable craft armed and armored for protection against small-arms fire as well as hostile pursuit.[3] These were important characteristics, for they represented the final product of war experience which was to influence the trends of design in observation aircraft for the next 20 years.

Although observation became the stepchild of military aviation later, it would be false to assert that it was unappreciated at the end of the war. In 1921 a lecturer in the Line Course School at Leavenworth summed up the prevailing Army attitude regarding this phase of military air power:[4]

> "Observation aviation may rightfully be called the backbone of the Air Service, and its importance is brought out by the fact that

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2. Tech. Sec., Div. of Mil. Aeronautics, "History of the Development of Airplanes During the War," in ATSC files, 1918-1919 McCook 314.7, Histories.
3. Lt. Col. T. H. Bane, SC, "The Part Played by the Air Service in Modern Battle," WD Info. Sheet 896, 29 Jan. 1918, in WF Tech. Data Lib., C11.1/10, Liaison.
4. Maj. E. L. Maiden, "Tactics and Technique of the Air Service," AS Line Course School lecture, Fort Leavenworth, 22 Sep. 1921, in WF Tech. Data Lib., C53/8, Obsn.

> during the World War, France, Germany, Italy, and the United States all considered that more observation squadrons were necessary for a well balanced army than any other type of squadron. It is possible for an army to operate without its bombardment aviation . . . but without its observation squadrons in a modern war, it would be most seriously handicapped with its blindness.

This opinion seems to be confirmed by the relative proportion of Air Corps airplane acceptances by type in 1920: pursuits, 112; bombers, 20; and observation, 1,000.[5]

The semiofficial Air Service Information Circular was equally positive in assessing the tactical role of observation to the end of World War I: "Whatever the future development of aviation may be, up to the end of the war in 1918 its most important function had proved to be securing and transmitting information concerning the developments in and beyond the line of battle."[6]

While spokesmen on every hand were willing to grant the logic of according observation aviation, in its inclusive sense, a high place in the role of military aviation, apparently little speculation or research was devoted to the task of working out the details of tactical operation. The 1st Corps Observation Group in the Toul sector reported that no close personal understanding based on good general tactical principles between staff and Air Service ever existed. The activities of the Air Service were unfamiliar to the staff, and lacking the incentive of urgency (the Toul sector was a comparatively quiet one), neither the staff nor the

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5. Chart prepared by WDGS Statistical Br., 1 Nov. 1938, in ATSC 319.1, Rept. of Major Activities of WD, 1929-1941.
6. "Notes on the Characteristics, Limitations, and Employment of the Air Service," AS Info. Cir., Vol. 1, No. 72 (12 June 1920), in WF Tech. Data Lib., A10/83 Rcn.

Air Service realized the gap that remained to be bridged. As a result, the later operations of the group during the period of maneuver at Château-Thierry were handicapped by lack of liaison experience.

The 1st Corps Observation Group at Château-Thierry brought out a number of vital tactical lessons in the application of observation aviation. Shortages in airdrome equipment and available labor troops to prepare new airdromes during the advance of ground troops proved a great handicap. Moreover, experience indicated that observation aircraft were more valuable as liaison agents for unit commanders than as a means for artillery-fire control during periods of maneuver. The importance of these lessons, in the light of developments during World War II, is difficult to overlook, but at the time the only conclusion which was unquestioningly extracted was that both the Infantry and the Artillery needed to be adequately trained in the principles of air-ground cooperation.[7]

Tactical experience showed that even armed observation was difficult without a strong friendly defense force unless it was carried out at low altitude and behind friendly lines. In attempting to evolve the principles of use for observation aircraft, it was suggested that corps commanders should avoid using observation aviation where the risk overbalanced the gain, for observation aircraft were not designed for combat.[8] This led to the logical question: exactly what functions should the observation aircraft designer seek to satisfy?

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7. "Tactical History of Corps Observation," AS Info. Cir., Vol. I, No. 75 (12 June 1920), in AF Tech. Data Lib., A10/83, Obsn.
8. "Notes on Recent Operations," AS Info. Cir., Vol. I, No. 76 (30 June 1920), in AF Tech. Data Lib., A10/83, Obsn.

The arms and technical services suggested that requirements for observation planes call for two- or three-place single-engine planes, fast, maneuverable, and armed. The record of tactical experience pointed out the importance of the liaison function of observation aviation, stressed the necessity of training all arms and services in the exploitation of observation, and suggested that successful operation would, in any event, be confined to friendly lines unless supported by pursuit aviation. This evidence, if scanty, provided a basis for establishing a doctrine for observation employment upon which to premise future observation aircraft design.

One factor, buried in the discussions of tactical experience, seemed to escape evaluation; namely, the difficulty of keeping airdromes operating near the corps area to be served. Although this problem was recognized during the Château-Thierry phase of maneuver, for the most part observation aviation functioned behind stable lines, and airdromes, once established, became adequate working bases with well-organized channels of communication to command posts and corps headquarters. During most of the last two years of World War I, because of the existence of fixed lines, there developed a habit of thinking in terms of "rear area" airdromes behind "front lines."

However much the tactical commentators may have favored observation during a war of maneuver, by far the largest part of experience, and consequently the detailed elaboration of tactical doctrine, was based on a concept of static rather than fluid warfare. The failure to appreciate the possibility that a future war might not be fought almost entirely behind static lines from established bases was of marked significance in the evolution of observation aircraft design. Since tactical concept

must precede design, the future of the observation type depended largely upon the estimate of tactical experience in World War I, and since that tactical experience proved heavily one-sided, it was perhaps not surprising that observation aircraft designs evolved as they did.

The observation airplanes conceived in the years immediately following the war reflected something of the prevailing lack of clarity in definition of the tactical functions included within the meaning of the term observation aviation. There were a number of Boeing and Atlantic De Havilland DH-4 types stemming from wartime versions, and in 1921 the Air Service tested the X-IL-1 two-place infantry liaison aircraft at McCook Field, where several experimental airplanes were fabricated in the following three years. These Air Service Engineering Division products, known as corps observation airplanes, were probably more important as experiments in all-metal construction than as examples of functional tactical design.[9]

An observation airplane competition in 1924 brought forward several designs which were to go far toward stabilizing or solidifying the design concept of observation aviation for years to come. The Curtiss O-1 and the Douglas O-2, competition winners, remained active under a number of guises and designations down to the 1930's. The original XO-1 had a Packard engine; the model submitted in the 1924 competition carried a Liberty engine; and subsequent versions alternated between Liberty and Curtiss installations. Altogether a total of 113 O-1 type observation

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9. Asst. Chief, Eng. Div., McCook to C/AS, 14 Jan. 1925, and Chief, Eng. Div., McCook to C/AS, 12 Jan. 1925, in ATSC 333.5, AS Investigation, 1925.

airplanes were manufactured, the final production model being the O-1G. Substantially the same story was repeated in the case of the O-2; and these same types, revised, improved, and modified, perpetuated themselves as the Douglas O-6, O-7, O-8, O-9, O-25, and the Curtiss O-11, O-12, O-13, O-16, O-18, and O-26.

The succession of major and minor modifications which marked the evolution of model designations is less important than the fact that these planes represented an accepted observation type from 1924 to 1930 and even as late as 1935, although by 1930 other versions had begun to appear.[10]

In 1924 the Air Service Tactical School at Langley Field published a manual on observation aviation tactics, which was described as a "compilation of the experiences gained by several officers in aerial observation during and subsequent to the World War." Despite such field experience, the manual made no reference to the types of aircraft to be employed for observation, apart from the suggestion that innovations necessitated continual changes in tactical use.[11] Unfortunately there was no clear idea at the Engineering Division itself as to exactly what the "new methods" were to be.

In 1925 Maj. Oscar Westover wrote from McCook Field asking for ideas from tactical squadrons regarding observation equipment. When the Office of the Chief of the Air Service replied, suggesting that army reconnaissance airplanes would require a high ceiling and a great radius of action, the Engineering Division was quick to reply that the "Ideal Specifications"

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10. Prod. Eng. Sec. Model Designations, Army Aircraft, January 1941, section on observation; ATSC 451.1, History of Air Corps Airplanes, 1941.
11. AS Tactical School course outline, "Observation," 1924-25, in WF Tech. Data Library, C53.223/9, Obsn.

prepared in 1923, the basis for 1925 procurement, contained no reference to a special Army observation type. The observation type, it was pointed out, was supposed to take care of all observation work and, with minor modifications, to become an attack airplane as well. With the addition of a supercharger, this same aircraft was expected to perform as a two-place fighter.[12]

As might have been expected, service questionnaires indicated a "great diversity of opinion" regarding the future development of airplanes. Some units believed observation airplanes should have an increased ceiling, others recommended special engine features and seating arrangements, but not one submitted a systematic analysis of the desired characteristics based on the function to be achieved.[13] Perhaps the comments of an interested airplane manufacturer, Grover Loening, of the Loening Aeronautical Engineering Corporation, came nearer to the mark:[14]

> You have tested innumerable observation planes at the Engineering Division, and I have witnessed many of the tests, but I have never yet been privileged to see a test of observation by an observation plane in which you declared the best plane to be the one that made the best observation in the shortest time. . . . You are unconsciously permitting tactical development to be subordinated to the development of joy-riding airplanes.

Other than tactical considerations were playing an active part in the procurement policies governing observation airplanes. This was evident in 1928 when Assistant Secretary of War F. Trubee Davison, at the suggestion of a member of the House of Representatives, proposed to install modern

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12. Maj. O. Westover, Eng. Div., McCook to OCAS, 7 Oct. 1925, and 1st and 2d inds., in ATSC Central files, McCook CO Obsn., 1924.
13. Actg. Chief, Airplane Br. to Chief, EES, 5 May 1927, in ATSC Central files, Exp. Eng. Sec., A, Airplanes.
14. Loening to C/MD, 23 Feb. 1927, in ATSC Central files, Exec. Corres., 360.01, Policy.

engines in lieu of Liberty engines in airplanes on the 1929 program. The Chief of the Engineering Division frowned on this suggestion, since the available funds could procure 93 observation airplanes with Liberty engines but only 55 with modern engines.[15] While this was only one episode in the evolution of observation airplanes, it does suggest the nature of the elements, apart from tactical evaluations, which influenced airplane design.

Similarly, observation aircraft, in company with all other classes, felt the influence of a shifting attitude and interest on the part of the aircraft manufacturers toward commercial planes and away from Materiel Division contracts. This presented a "very serious situation," the Air Corps Technical Committee reported early in 1929. Lack of interest was apparently "delaying the execution of experimental and development work on military types for the Air Corps." Industry no longer cared to amortize the costs of experimental engineering on purely military types since subsequent production and profits were uncertain, and as a result the committee doubted that "any proper development of a new plane" could be accomplished in time for the next production procurement of observation airplanes.

While this disconcerting industrial trend was under way, however, an even more important development appeared within the Air Corps itself. As technological advances permitted faster airplane speeds, observation airplanes, in company with all other classes, were carried along by the trend. Twin engines were planned for the army observation airplane,

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15. Memo for C/AS by S/W, 15 May 1928, and Chief, Eng. Div. to C/AC, 23 May 1928, in AESC 452.1, Obsn. Procur. of 1929 Program.

and the Technical Committee pointed out that such an aircraft would require a "lighter and faster" type for "close reconnaissance."[16]

A confusion of concept was evident. A lighter plane might have been suited to "close reconnaissance," but a faster plane seemed to deny that function. The postwar Air Service had interpreted World War I experience by grouping a variety of tactical functions within a single class called observation, but by 1929 there appeared an interesting tendency to question this single grouping. Of far more importance than the perfection of several types of aircraft from year to year was the evolution of this concept of function within the meaning of the term observation, as it grew from the end of World War I to World War II.

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16. Proceedings of the AC Technical Committee, 16-17 Jan. 1929, in ATSC 334.8, AC Tech. Com. 1929.

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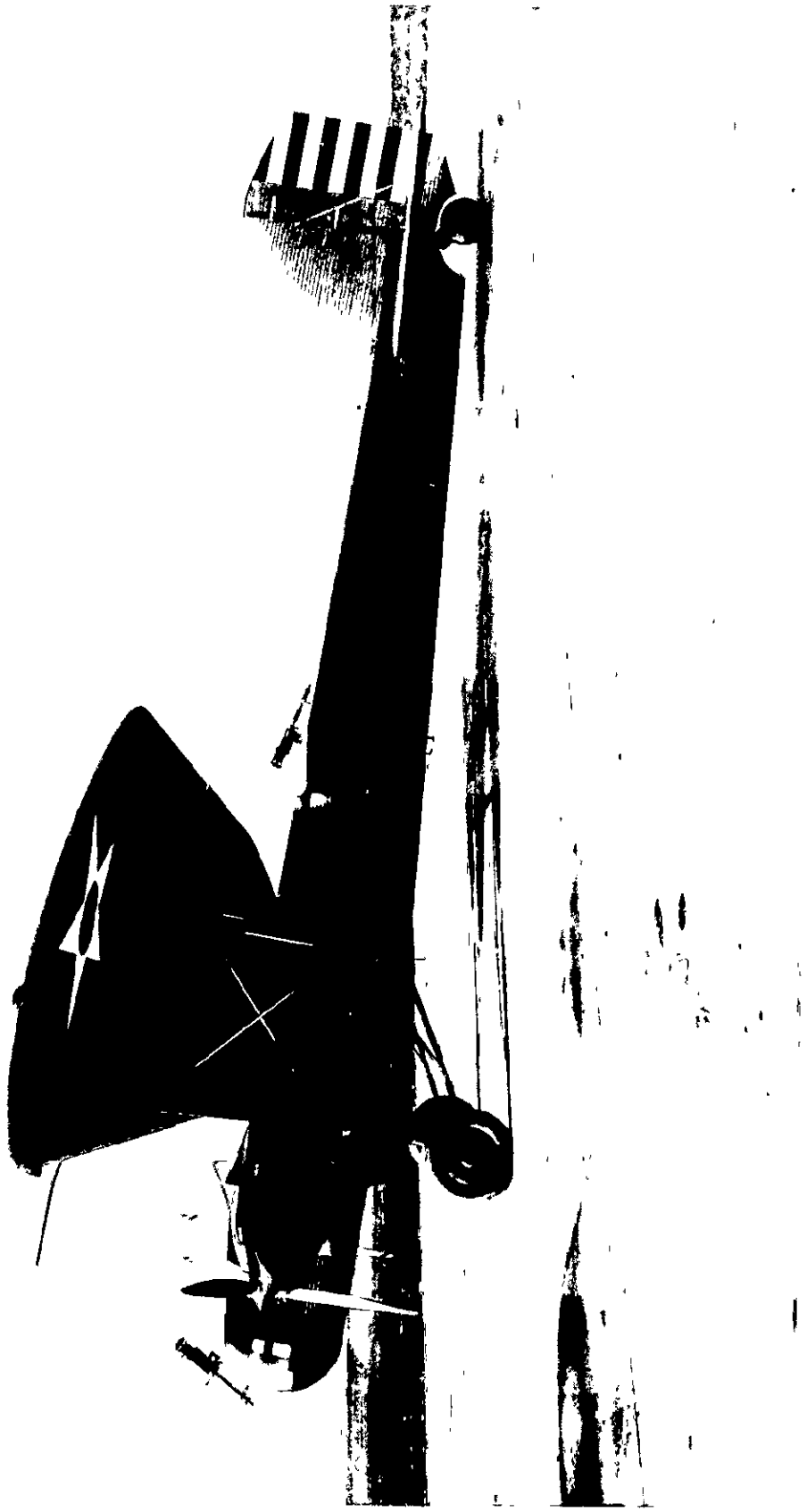

Chapter II

EVOLUTION OF THE OBSERVATION AIRPLANE, 1929-1937

When the rapid increase in aircraft performance led the Air Corps Technical Committee to recognize the necessity of dividing observation aviation into two broad categories, authorization was granted to implement this decision.[1] The Office of the Chief of the Air Corps (OCAC) prepared orders in March 1929 for a board of officers to determine the tactical requirements of a corps and division airplane upon which to base a directive for experimental design and development. Significantly, the board was composed entirely of Air Corps officers, despite the fact that the subject under consideration was an airplane to operate in conjunction with ground forces at the corps and division level.

To guide the board in its deliberations, OCAC prepared a list of instructions suggesting the advisability of consulting the Air Corps Tactical School and Wright Field in arriving at any conclusions. The board was admonished to remember the basic distinction which the Technical Committee had established: Army observation aviation consisting of twin-engine strategic observation airplanes, and corps and division observation aviation consisting of single-engine tactical observation airplanes. The OCAC directed that careful consideration be given to the special mission of corps and division observation airplanes and that the board's

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1. Proceedings of the AC Tech. Com., 11-13 March 1929, in ATSC 334.8, AC Tech. Com. 1929.

conclusions be submitted in tangible recommendations regarding load-carrying capacity, high speed, and maneuverability for the desired aircraft.

The Observation Board studied the mission of the proposed corps and division airplane and concluded that it should conform to the general definition of the army corps ground-observation mission as expressed in official doctrine: reconnaissance penetration into hostile areas not in excess of 25 miles; cooperative action with the Infantry, Cavalry, and Field Artillery; special command and messenger missions, as well as photography missions over hostile areas. In addition to a number of specific technical recommendations regarding the selection of engines and accessory equipment, the board unequivocally declared: "High speed at sea level shall be the predominating performance characteristic of this airplane." While maneuverability was of utmost importance and improved vision required consideration, high speed to outrun hostile pursuit was given first priority. To complement this defensive speed, the board recommended one fore-firing fixed and two Scarff-mounted flexible .30-cal. machine guns, the traditional armament of observation aircraft.[2]

The recommendations of the board were accepted in a large measure as official policy. Although the Chief of the Air Corps favored monoplanes and thus challenged the board's continued faith in the rugged, shock-resisting qualities of the biplane, they both agreed that the corps and division airplane should be fast and maneuverable. The Materiel Division was directed to develop such a plane, and even though OCAC, with

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2. Board Proceedings on General Requirements for a Corps Observation Airplane, 10 April 1929, in ATSC 334.7, Board Proceedings, Attack Airplanes Board, 8 April 1929.

a view toward the realities of combat conditions, suggested that corps and division planes should be "capable of operating from the kind of airdrome usually found near the front lines," the directive to the Materiel Division contained no such specification. Far from requiring an aircraft for unprepared fields, the directive stipulated a landing speed of 60 m. p. h., one-third the current top speed of 180 m. p. h.[3]

In the spring of 1930, when a student officer at the Staff and Command School sought help at Wright Field in preparing a paper on observation aviation, an informal opinion expressed by a unit chief within the Supply Division indicated that isolated opinions differed markedly from the consensus. The unit chief suggested that observation planes should be of "handy control at low speed" and possess marked ability to get into and out of small fields surrounded by trees. Actual landing speed was not considered so important, but length of roll as modified by brakes was extremely so.[4]

If occasional individual opinions were at variance with the Observation Board's report, the views of the Tactical School were not. The Commanding Officer at Maxwell Field informed the Chief of the Air Corps that the service-type observation airplane was too slow. In line with current British trends, he favored an increase in speed to permit the observer to return to friendly areas as fast as possible after gathering

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3. OCAC to TAG, July 1929, in ATSC central files, Progress Report on Development Work. See also OCAC to C/MD, 3 Aug. 1929, in ATSC 452.1, Obsn. and Attack, General Requirements, 1933.
4. Maj. H. H. C. Richards to Chief, Supply Div., MF, 2 May 1930, et seq., in ATSC 452.1, Night Obsn. Plane, 1930.

the necessary information.[5] The three basic requirements for observation aviation, the writer declared, were: (1) speed to bring the observer quickly to the point of delivery, (2) special equipment to facilitate observation, and (3) special equipment to expedite delivery to the ground point.[6]

As if to emphasize this comparative unity of opinion, the Assistant Chief of the Air Corps, Brig. Gen. Oscar Westover, informed the General Staff that no new doctrine was developed during the latter part of 1931 in regard to the principles of combat and the employment of Army aviation. Speaking of observation aviation in particular, he said: "Cooperative work with ground and naval units has continued along conventional lines."[7] Just what he meant by "conventional lines" may be inferred from a study of official doctrine on air-ground cooperation, formulated in the Manual for Commanders of Large Units. In a section entitled "The Corps in Offensive Action," the manual dismissed aviation with the sentence: "Aviation and the Army cavalry should make the first contact with the enemy." In the discussion on the conduct of attack, the role of aviation was briefly amplified to include definitely assigned missions and artillery-fire adjustment. Similarly, the section entitled "The Infantry Division in Offensive Battle" dismissed aviation with but passing mention as an asset in extending in depth the zone under observation by the cavalry and armored scout units.[8]

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5. CO, Maxwell Field to C/AC, 27 Oct. 1930, in ATSC 334.7, Board Proceedings, Obsn. Board, 29 Dec. 1930.
6. Inds. 1 thru 7, in ibid.; and ATSC 452.1, Obsn. and Attack, General Requirements, 1933.
7. Brig. Gen. O. Westover to TAG, 23 Feb. 1932, in ATSC 400.112, Exp. Research & Development Program, 1932.
8. A Manual for Commanders of Large Units (Prov), Vol. 1, Opns., 1930, pp. 33, 42, 60.

The vagueness which seemed to prevail with regard to the exact, detailed tactical functions of observation aviation at the command level was reflected in contemporary thinking about the type of aircraft required for observation. A Maxwell Field officer, Maj. Donald Wilson, considered the distinction between aircraft suitable for corps and division, army, and general headquarters uses as unnecessary:[9]

> The need for observation beyond the sphere of interest of the armies (about seventy-five miles) is centered in GHQ and the air force. But since the air force is the only thing with which GHQ can strike at great distances, GHQ observation is one and the same thing as air forces observation, and that is the only observation that requires extreme radius of action. So the place where observation airplane types separate is between that working with the ground forces and that working with the air force.

Major Wilson's contention divided observation aviation into two types, corps, division, and army airplanes on the one hand and air force strategic observation on the other, a distinctly different concept from the official doctrine which differentiated between corps and division tactical observation and army strategic observation.

The Materiel Division did not attempt to argue the point but indicated that in the development of observation airplanes, as with any other class, the directives published "at the instance of the Chief of the Air Corps" set up the fundamentals to be followed by the Materiel Division. The chief of this division, in turn, relied upon a series of boards of officers for his opinion, and these representative boards were, in the final analysis, mainly responsible for the general plan of any development.[10] The composition of the board, then, becomes a consideration

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9. Maj. Donald Wilson to Chief, Eng. Sec., MD, WF, 17 Oct. 1932, in ATSC 452.1, Obsn. and Attack, General Requirements, 1932.
10. Chief, Eng. Sec., MD, WF to CO, Maxwell Field, 29 Oct. 1932, in ibid.

of utmost importance.

After a board convened to compare the YO-31A and the YO-40 in 1932, its report declared: "The YO-40 airplane is by far the best developed airplane to date from an observer's standpoint. It more nearly approaches the ideal than any produced in this country."[11] But what was the basis of judgment used by the board in measuring the airplane for tactical utility? There were no ground force officers on the board, even though the equipment was destined for air-ground cooperation work.

Despite the board's superlative statement, it was apparent that a great uncertainty existed in the field of observation aviation. In the case of bombardment aviation the objectives were clear cut, with increases in weight-lifting capacity as well as range and ceiling offering specific objectives. But the term observation lumped together a variety of objectives which tended to blur the focus in reaching decisions regarding the development of equipment. This confusion showed itself in the issues raised over the function and formation of boards.[12]

Symptomatic of the whole board question was the statement of General Westover suggesting one board to decide on all types of aircraft designs. A single board would insure "continuous development along previously accepted and approved lines" much better than the prevailing system of specialized boards. If General Westover's recommendation seemed to put too much emphasis on the improvements of existing equipment, a mock-up board convening on the O-40, a new Curtiss corps and division airplane,

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11. Board Proceedings to Compare YO-31A and YO-40, 18 April 1932, in ATSC 334.7, Board Proceedings, 1932.
12. Board Proceedings on O-43 Cockpit Mock-up, 24 May 1933, in ATSC 334.7, Board Proceedings, 1933.

did not. The board was of the opinion that the development of observation aviation and its equipment had not kept pace with the other classes of aviation. Stressing the necessity of coordinating all development activity with ground force units, the board recommended the formation of an observation board with Materiel Division representatives in an advisory capacity.[13]

Materiel Division reaction to this recommendation opened the whole question of the relationship of tactical utility to engineering possibility. The division rejected the idea of a permanent board. While admitting the necessity for continuity of thought, it pointed out that such continuity "must not lead to adamantine set routine" which would be a bar to "progress and newer trends," but must be stimulated through the infusion of new ideas and fresh points of view. A permanent board would tend to become inconclusive, "self-perpetuating, dictatorial, and hidebound." In contrast, the division considered the current system, predicated upon the definite progress evident since it was inaugurated, as eminently successful.

The Materiel Division, furthermore, insisted on a participating rather than advisory status for itself:[14]

> It is impossible for aircraft boards to separate tactical needs from engineering requirements and necessities. Therefore any airplane must be an engineering achievement based on tactical requirements. It is only by the carefully considered balancing of the importance of these requirements that aircraft type progress is possible. The engineering personnel must be the balance wheel in the system.

The proposal for a permanent observation board was not approved, but the agitation was followed by a revised procurement technique. The

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13. Ibid.
14. Ibid.

Chief of the Air Corps appointed boards to consider new aircraft types, and each board was to consider only tactical characteristics and "utility as to type," while the Materiel Division's Engineering Committee and Flight Test Unit at Wright Field were to evaluate performance, engineering characteristics, structure, materials, etc.[15] The conflict of opinions regarding the composition of boards and the concept of observation aviation was far from being lost motion. Besides revamping the procurement procedure to reflect a more conscious appreciation of tactical utility, the boards selected to evaluate specific airplanes showed an increased interest in tactical and functional factors.

In 1933, another board, appointed to determine the suitability of the YO-40A and the YO-40B for observation purposes, made special note of the flaps and slots for slow flying as well as the landing and take-off characteristics as measured by feet of roll. An improved concept of combat use was evident in the board's recommendation to improve the landing gear "to permit faster taxiing over rough terrain without excessive bouncing." Moreover, the board, of which Maj. Donald Wilson was a member, pointed out that the great variance between tactical observation for the ground force and strategic observation for the air force made it mandatory to develop observation around two types, army, corps, and division airplanes and air force airplanes, the two types to be governed by separate tactical directives.[16]

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15. C/MD to C/AC, 12 Sep. 1934, in ATSC 334.7, Board Proceedings, Obsn. and Pursuit Evaluation, 1935.
16. Board Proceedings on Suitability of YO-40A and YO-40B, 15 Sep. 1933, in ATSC 334.7, Board Proceedings, 1933.

In October 1935 the basic observation training regulation, TR 440-15, was revised to consider short-range (three-hour) observation airplanes and balloons as one type and long-range (eight- or 10-hour) observation airplanes and dirigibles or airships as the other type.[17] In the same year the Chief of the Air Corps forwarded the military characteristics of the GHQ long-range observation aircraft to The Adjutant General for record.

The long-range observation airplane's mission was to include "long distance reconnaissance" reporting on the disposition and activities of hostile ground, air, and naval forces. This type was to be multiengined and to have high performance characteristics, such as 200 m. p. h. at 10,000 feet, seven-hour endurance, climb to 10,000 feet in 10 minutes, and several other qualities falling within the contemporary definition of a high-performance aircraft.[18]

As early as 1933 a sum of money had been allocated from available research funds to experiment in converting a Martin B-10 bomber for long-range observation purposes, but the real line of demarcation probably occurred in 1936, when the designation "Long Range Multiple Engine Observation Airplane" was changed to "Reconnaissance Airplane."[19] The process of breaking the observation class down into its functional components had thus begun. In a sense, the evolution of the liaison

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17. Draft of changes for TR 440-15, 15 Oct. 1935, in ATSC 452.1, Mil. Characteristics, Obsn. and Rcn., 1935-1936.
18. Asst. C/AC to TAG, 8 May 1935, in ATSC 452.1, Airplane Directives, General Requirements, 1927-1936.
19. IOM, Asst. Chief, Procur. Eng. Br. to Chief, Eng. Sec., 14 July 1936, in ibid. See also memo for Maj. Gen. B. D. Foulois by Chief, Eng. Sec., 9 Nov. 1933, in ATSC 400.112, Exp. and Research Program, FY 1934.

aircraft type was to be little more than the completion of this process, a segregation of the many tactical utilities originally contained within the meaning of the term observation.

Before turning from the story of the reconnaissance type entirely, it is of interest to note a recurring factor which was having a detrimental effect on research and development. The urgency encountered in issuing procurement data for 1936 funds led the Chief of the Materiel Division Engineering Section to recommend that the Procurement Section issue circular proposals on the basis of information "substantially similar" to that of observation types procured with 1935 funds.[20] This particular case may not have been critical, but the practice indicates yet another factor among the elements tending to delay the development of aircraft types. Tactical concepts were evolving slowly enough without the burden of purely "administrative" factors.

If the Materiel Division found it difficult to hasten the development process, the fault was not entirely administrative. Again and again the theme recurs: "as evidenced from reports received, little employment in tactical training missions was carried out," and "little constructive criticism was received governing the requirements" for the observation type.[21] Without an adequate flow of constructive criticism from the tactical units, the Materiel Division could not hope to perfect aircraft types.

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20. ICM, Chief, Eng. Sec. to Chief, Procur. Sec., 25 July 1934, in ATSC 452.1, Obsn., Evaluation of Mil. Characteristics, 1933-1936.
21. Board Proceedings on Suitability of YO-40A and YO-40B, 15 Sep. 1933, in ATSC 334.7, Board Proceedings, 1933. See also ind., C/MD to C/AC, 21 Nov. 1933, in ibid.

Although the reconnaissance airplane became a comparatively established type, the corps and division concept still remained far from definitive. Typical of the confusion of thinking regarding observation aircraft was the problem of oxygen equipment raised at the time of the quarterly test of airplanes with full military load made in 1933. Specifications called for observation aircraft equipped with oxygen sufficient for two hours at 20,000 feet. The Materiel Division pointed out that every effort was being made to comply, but the corps- and division-type airplane was not built for use with oxygen. Apparently without regard for the fact that the corps and division airplane was designed for ground force observation and was thus primarily a comparatively low-altitude aircraft, General Westover ordered that corps and division observation-type directives should be amended to include adequate oxygen requirements.[22]

As late as September 1938, this indecision persisted in the military characteristics for corps and division airplanes, which stipulated the inclusion of oxygen equipment, tow-target installations, and built-in flotation gear.[23] Not only was there a considerable area of disagreement regarding minor or accessory equipment, but on major issues as well the observation airplane question continued to remain unsettled.

With the corps and division airplane committed to a policy of speed and armament for defense, an OCAC officer, Maj. Carl Spaatz, suggested that it would be wise to develop a three-place rather than a two-place

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22. Exec., MD to C/AC, 25 Aug. 1933, and 1st ind., 5 Sep. 1933, in ATSC 452.1, Obsn. and Attack, General Requirements, 1932.
23. C/AC to TAG, 26 Sep. 1938, in ATSC 452.1, Mil. Characteristics, Obsn. Airplane, General, 1936-1938.

observation airplane in order to provide for a trained gunner constantly on the alert for interception. This would leave the observer completely free for his duties. It would provide space for a staff officer on command missions and guarantee adequate fire-power protection, instead of relying on a staff officer observer unskilled in flexible aerial gunnery.

The Materiel Division disapproved of Major Spaatz' idea, claiming that a three-place observation plane would be impractical and necessarily heavy, costly, and cumbersome. The Engineering Section chief denied Spaatz' contention regarding the superior performance of low-wing monoplanes, saying that the difference was "more apparent than real," and that single-place observation airplanes might even prove superior to two-, let alone three-place aircraft.[24]

The approved military characteristics for corps and division observation airplanes in 1934 probably represented Materiel Division opinion. This type, a single-engine two-place airplane, had a tactical mission including "all short range reconnaissance" and the task of locating targets and adjusting fire for the artillery as well as serving as a liaison agent for the use of ground commanders. Its performance characteristics called for a high speed of 200 m. p. h., a 20,000-foot ceiling, and a maximum landing and take-off run of 1,500 feet to clear 50-foot obstacles.[25] However, the supporters of the three-place observation airplane were not

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24. Chief, Eng. Sec., MD, to Maj. Carl Spaatz, OCAC, 8 Nov. 1933, in ATSC 452.1, Obsn. and Attack, General Requirements, 1932.
25. C/AC to TAG, 24 May 1934, in ATSC 400.112, Procur. Methods of 1934.

without effect. In December 1934 The Adjutant General, reflecting General Staff opinion, approved a three-place "ground force observation" airplane for "experimental purposes."[26]

A circular proposal design competition brought forth a North American Aviation product the O-47, "primarily designed for a Ground Force observation airplane," with first consideration given to its "efficiency as a military weapon." Apparently the board for appraising the design knew what "efficiency as a military weapon" implied, for its report declared that the airplane met the requirements for an observation airplane more fully than any hitherto submitted.[27] Having freed observation from strategic reconnaissance, the Air Corps seemed to be back where it started before the separation, for three-place airplanes, being heavier than two-place, again raised the question of twin-engine aircraft.

The Materiel Division prepared specifications for three different types of aircraft, single-engine two-place, single-engine three-place, and twin-engine three-place, but pointed out that three separate bids and three separate proposal evaluations would prove extremely costly, since the division's funds would permit procurement of only one type.[28] Since the Observation Board favored the North American Aviation O-47 so highly, OCAC approved the three-place type for future procurement with either single or twin engines.[29] This diversity of choice continued until

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26. Chief, Eng. Sec. to Chief, Materiel Liaison Sec., OCAC, 24 Sep. 1934, in ATSC 452.1, Obsn., Evaluation of Mil. Characteristics, 1933-1936.
27. Board Proceedings, C.P. 35-405, 4 June 1935, in ATSC 334.7, Board Proceedings, 1935.
28. Exec., MD to C/AC, 31 Aug. 1934, in ATSC 452.1, Obsn., Evaluation of Mil. Characteristics, 1933-1936.
29. Actg. C/AC to TAG, 1 Nov. 1935, in ibid.

September 1937, when OCAC informed the General Staff of a decision to eliminate the twin-engine variant inasmuch as the Air Corps and the National Guard were satisfied with the single-engine North American O-47 type, and since it seemed wise to avoid encouraging manufacturers to incur unnecessary expense in developing two completely different types.[30] Apparently nontactical factors entered heavily in the decision to abandon twin-engine corps and division observation airplanes.

The decision to limit corps and division aviation to single-engine aircraft did not, however, solve the problem of the two- versus three-place versions. While OCAC strongly favored three-place observation airplanes, the question was forwarded to the commanding generals of the First, Second, Third, and Fourth Armies and the National Guard Bureau. The Second Army and the National Guard Bureau concurred with OCAC without particular comment, but the First Army expressed the opinion that the two-place type was superior since it was more maneuverable and could avoid ground fire more readily than the heavier, three-place airplane. Essentially the problem of corps and division aviation appeared to be the question of whether speed and maneuverability or increased fire power would guarantee adequate protection for observation. If the Materiel Division seemed to underrate tactical considerations, the ground forces were not prolific with helpful criticisms.[31]

A further illustration of the nontactical and therefore nonfunctional elements entering into the decisions regarding the evolution of corps and

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30. OCAC to TAG, 11 Sep. 1937, in AFSC Central files, Obsn., Mil. Characteristics, 1936-1938, 1940.
31. Ibid., with inds.

division aviation appears in the case of National Guard airplane procurement. The approved military characteristics for corps and division airplanes in 1936 called for a single-engine, three-place, 10,000-pound gross weight airplane with a high speed of 225 m. p. h., but the National Guard Bureau felt that it was unnecessary to require that National Guard units cooperate in "experimental work." The bureau pointed out that National Guard observation planes were 155 m. p. h. types and that an increase to 185 m. p. h. would constitute a "not unfair progression" for National Guard airplanes.

The Materiel Division objected to any such double standard for Air Corps and National Guard airplanes performing the same mission because it was contrary to training policy and immeasurably increased the difficulties of procurement. Nevertheless, the Chief of the Air Corps approved the bureau's plan because lower performance airplanes could be procured in greater numbers with the funds available.[32] The decision was of peculiar interest in regard to the evolution of observation aviation types, for it illustrated once again the weight of nontactical factors in aircraft development.

Fiscal considerations inevitably intruded upon aircraft type development. In 1937 the Air Corps planned to effect a hedge against rising production costs by contracting for two years' requirements at one time.[33]

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32. Actg. C/AC to TAG, 30 June 1936, in ibid. See also National Guard Bureau to OCAC, 14 June 1934, with 2d ind., 26 June 1934, and C/AC to TAG, 10 Aug. 1934, in ATSC 452.1, Obsn., Evaluation of Mil. Characteristics, 1933-1936.
33. Memo for S/W by Col. J. H. Burns, Exec., OC Ord. Dept., 27 April 1937, in ATSC 121.4, Procur. Program, 1938.

Building up stocks of airplanes in a period of dynamic design change threatened to net a force of aircraft short of the best. Similarly, in October 1938, when a tactical organization recommended some specific changes in the approved military characteristics of observation types, OCAC disapproved the idea "in view of the proposed Expansion Program."[34] While the processing of any changes in the existing approved military characteristics for a type would be time-consuming, nevertheless the policy followed was destined to obtain aircraft not suited to tactical requirements, and even greater time delays were to occur later when a more functional type had to be procured under the urgency of war conditions.

A résumé of the principal corps and division types procured in the decade before World War II helps to illustrate the difficulty of establishing a balance between tactical considerations and the fiscal as well as engineering problems that accompanied the evolution of observation aviation. The Douglas O-31 corps and division observation airplane of 1930 represented a line of departure from traditional types. It was a gull-wing monoplane with an all-metal monocoque fuselage. The three-place O-35 continued this type. A year later the Curtiss O-40, with retractable landing gear and enclosed cockpits, marked a minor step forward, but the Douglas O-43 of 1933 represented a significant step beyond the O-35 because it added a parasol wing which improved observation appreciably. The corps and division observation airplane type reached its culmination in 1935 with North American Aviation's O-47, a three-place, mid-wing

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34. CO, 97th Obsn. Gp. to C/AC, 24 Oct. 1938, and 4th ind., OCAC to C/MD, 29 Nov. 1938, in ATSC 452.1, Obsn. Corps and Div., 1939.

monoplane, which was procured in greater quantities than any other observation type since World War I.

The relationship between quantities procured and tactical experience is obvious. The following chart, showing aircraft acceptances from 1920 to 1937, indicates that the corps and army types of observation airplanes did not, numerically at least, suffer in comparison with other classes.[35]

Aircraft Acceptances

	Pursuit	Bomber	Observation
1920	112	20	1,000
1921	200	65	270
1922	60	25	200
1923			180
1924	35		127
1925	18	2	126
1926	83	1	176
1927	49	9	56
1928	69	34	151
1929	78	22	185
1930	103	30	122
1931	143	73	233
1932	207	68	136
1933	6	13	44
1934	113	38	27
1935	7	10	24
1936	23	89	3
1937	3	32	88

In active flying, as well, observation airplanes ranked high in use. In 1935 they were second in "average number flying" and led the list in accident losses:[36]

Aircraft Types	Average Number Flying	Per cent of Wrecks to Average
Observation	308	20.8
Pursuit	397	15.9
Bomber	155	12.9
Primary trainer	205	6.8

35. Chart prepared by WDGS Statistical Br., 1 Nov. 1938, in AFSC 319.1, Report of Major Activities of War Dept., 1929-1941.
36. Budget Officer, MD to OCAC, 25 July 1936, in AFSC 452.1, Reports to OCAC, 1940.

These figures certainly do not imply inactivity. Flying time computations for about the same period were comparable. The total number of aircraft flying hours, January-June 1936, were as follows:[37]

	Hours
Observation	54,982.3
Pursuit	58,652.3
Bomber	32,608.0

These figures are in sharp contrast to lighter-than-air flying time for the same period:

	Hours
Spherical balloons	41.3
Observation balloons	439.8

It would be a mistake, however, to assume that the number of hours credited to observation actually represents time spent "observing." Observation airplanes were used extensively for tow-target work and as personnel transports in cross-country flights, not to mention the number of hours marked up to observation which in reality were devoted to "getting in flying time."

Without extensive field experience and actual participation in field maneuvers with troops, observation airplanes, regardless of the number of hours in flight recorded, were almost certainly destined to be inadequate, for unlike the other classes of aviation with sharply focused objectives, the definition of "observation" left much to be desired as a yardstick in developing airplanes from an engineering standpoint. In order to understand the tactical objectives of observation aviation more clearly, it is well to consider the tactical problem in some detail.

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37. Budget Officer, MD to OCAC, 8 Nov. 1936, in ibid.

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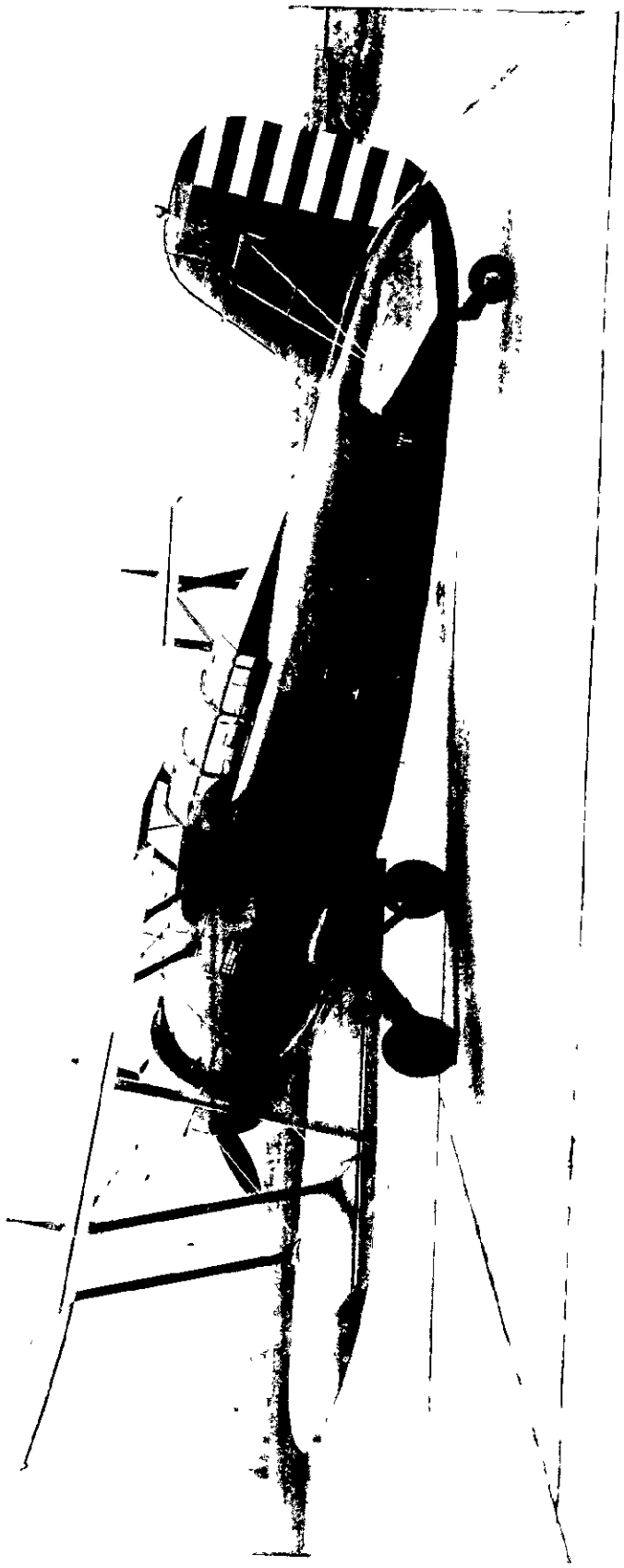

Chapter III

THE OBSERVATION AIRPLANE IN USE, 1927-1937

In November 1932 OCAC directed all wings, groups, tactical squadrons, and flights in corps area and school installations such as Forts Benning, Sill, Riley, and Bragg to prepare for a quarterly full military load test designed to insure the readiness of all tactical units at all times for immediate field service.[1] Some idea of the difference between the ideal and the actual may be obtained from considering the reply of the Materiel Division chief to this test plan. While concurring that a quarterly test would be stimulating, he commented: "It must be expected, however, that full military equipment will not be available in all cases at this time, specifically in the matter of oxygen, radio, armament, and night lighting equipment."[2] Even more appalling, perhaps, was the suggestion of a National Guard unit that the technical supervisor might just as well make the inspection at his next visit. The Materiel Division pointed out in reply that the quarterly test was to be a tactical, not a technical inspection.

If at times the Materiel Division seemed slow in perfecting equipment of tactical utility, the tactical units in the field were not without fault in the matter. An already difficult situation was further aggravated when the instructions regarding the tests were misrouted, and the

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1. Asst. C/AC to TAG, 16 Nov. 1932, in ATSC 452.1, Quarterly Test, 1938.
2. Exec, MD to C/AC, 12 Nov. 1932, in ibid.

project which had been initiated in the fall of 1932 was in some cases delayed until July 1933.[3]

The quarterly tests in 1935 reflected a similar situation. The 17th Pursuit Group at March Field, Calif., reported that there were airplanes which had been in tactical groups for almost a year and "so far it has been impossible to completely equip them suitably for active field service."[4] In 1937 the situation was little better. The 91st Observation Squadron at Fort Lewis, Wash., reported that of a total of 13 airplanes, 4 were not flown because they could not be started, 2 others were not flown because they were temporarily out of commission for repairs, 1 had been condemned as obsolete, and finally, 2 others that did manage to take the air experienced malfunctions.[5] The units in the field, it would appear, were scarcely in any condition to offer much in the way of extensive tactical suggestions.

Periodic maneuvers by tactical groups in conjunction with ground troops were undoubtedly the most important phase of tactical experience with observation aviation. The following chart, tabulating the numbers and classes of aircraft involved in one of the earliest maneuvers (1927) to be held after the Air Service became the Air Corps, illustrates the limited scope of activity which hampered the evolution of aircraft types.[6]

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3. Asst. C/AC to TAG, 16 Nov. 1932, with 9th ind., Hq. 35th Div. Avn., Mo. National Guard to TAG, 1 Feb. 1933, and 11th ind., MD to Mo. National Guard AG, 11 Feb. 1933. All in ibid.
4. OCAC to MD, 25 Feb. 1935, in ibid.
5. Hq. 91st Obsn. Sq. to C/AC, 26 Jan. 1937, in ibid.
6. Exec., OCAC to C/MD, 14 Feb. 1927, in ATSC Central files, Exp. Eng. Sec., M, Maneuvers.

	Pursuit	Bomber	Attack	Cargo	Observation
Fort Benning	4	4	12	3	
Fort Riley	8	8	8	3	4
Fort Leavenworth	8	8	8	3	4
Fort Sill	8	8	8	3	4
San Antonio	30	20		13	17

If these limited concentrations indicate the condition of the Air Corps as a whole, the specific situation regarding observation aviation was no different. In 1930 the 16th Observation Squadron was broken into flights stationed at Forts Benning, Bragg, Riley, and Sill, while a detachment of the 88th Observation Squadron was attached to the Cavalry Division at Fort Bliss. The Chief of the Air Corps recognized that some greater concentration was necessary "in strict justice to a large number of Infantry, Cavalry, Field Artillery, and Coast Artillery tactical units . . . some of which have never even seen an Air Corps tactical unit." With such conditions prevailing, it is little wonder that the observation airplane evolved as slowly as it did.

The Secretary of War appointed a board to study the problem, and a plan was effected to concentrate observation in four groups geographically covering the continental area of the United States.[7] But mere concentration alone did not insure tactical cooperation with ground troops. More important in this respect were the maneuvers held at Fort Riley in 1932.

Two airplanes were regularly assigned to Fort Riley, but it was believed that at least five should beemployed during the maneuver period. The Chief of the Air Corps was anxious to cooperate in providing additional airplanes in order to obtain the "additional training which should accrue

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7. C/AC to TAG, 20 Dec. 1930, in AFSC, 400.112, Five Year Program.

from the proposed exercises," but raised the question of where the funds for travel would be found.[8]

Such minuscule aerial participation in ground force activities was not the exception. In September 1932, VIII Corps Area Headquarters informed The Adjutant General: "In order to give the Cavalry Division a minimum of training with observation planes, it has been necessary to send one plane with a team to Fort Bliss monthly. This has been satisfactory under normal conditions."[9]

In the same year the Chief of the Air Corps organized a staff and command training exercise utilizing an air division of three pursuit groups, two bomb groups, and one observation squadron, with the express intention of developing the "tactics of each branch of the Air Corps." However valuable the exercise may have been in perfecting large-scale air action, it is significant that no ground forces participated, and so far as observation aviation was concerned, only a very limited number of tactical functions of observation could be perfected without exercises in cooperation with ground troops. Even within the limitations imposed by the absence of ground troops, the project could scarcely be an overwhelming tactical success in view of the fact that the single observation squadron assigned to participate in the exercise, the 91st Observation Squadron, was composed of three airplanes, six officers, and three enlisted men.[10]

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8. Chief, Cavalry to TAG, 11 April 1932, in ATSC 361, Maneuvers, Fort Riley AC Cavalry, 1935.
9. Hq. VIII Corps Area to TAG, 17 Sep. 1932, in ATSC 452.1, Allocation of Airplanes, 1933.
10. C/AC to TAG, 29 Sep. 1931, in ATSC 361, Staff and Command Exercises, 1932.

Although the all-Air Corps exercises lacked the important element of training with ground troops, some cooperative efforts were made to offset that shortcoming. In October 1932 the Air Corps participated in a joint Air Corps-antiaircraft exercise at Fort Knox, Ky. A résumé of the operations assigned to observation units illustrates the concept of use at that time. Daylight observation elements were to perform photo reconnaissance; to serve as hostile airdrome reconnaissance, that is, to linger over hostile airdromes warning attackers when pursuits were to take off; and finally, to serve as advance guard for bombardment aviation, that is, to fly some 30 miles off bomber formation flanks to warn of hostile attacks. The lack of realism in this plan of operation may be judged by contrasting it to the role actually played by observation under combat conditions in World War II.[11]

The concept of tactical observation, however, could not evolve without a vigorous and continuing association of Air Corps and ground force units. When, in 1934, the Air Corps planned to send an observation squadron to Fort Riley to supplement the airplanes already stationed there in conjunction with the spring cavalry maneuvers, the project had to be abandoned because the necessary observation airplanes had to be drawn off to fly in the air-mail service. When three O-19 airplanes finally were scraped together for the maneuver, they were restricted as to the total number of hours of participation inasmuch as the time spent at the maneuvers had to be credited to the total allocation of flying hours.[12]

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11. "Plan for Joint Anti-Aircraft-Air Corps Exercises. Fort Knox, Kentucky," 8-21 Oct. 1932, AC Annex, Sec. IV, Plan of Operations, in ATSC 561, Fort Knox Maneuvers, 1933.
12. Exec., OCAC to TAG, 16 April 1934, et seq., in ATSC 361, Maneuvers, Fort Riley, AC-Cavalry, 1935.

Against such obstacles the detailed perfection of tactics made but little headway.

The Fourth Army maneuvers in 1937 typify the shortcomings of air-ground observation in the preceding decade. The VII Corps Air Officer, reporting on observation activities, noted that as a result of inadequate organizational equipment which made it impossible for squadrons to function separately, and because of the lack of available existing landing fields in the maneuver area, the squadrons of the opposing forces were based on the same airdrome! The report raised further criticisms, that the lack of large bodies of troops hindered realistic training and that poor liaison existed between observation units and divisional staffs.

As a result of this experience, the Air Officer at the maneuvers recommended that future combined-arm maneuvers should be stressed, separate airdromes should be provided, and every effort should be made to obtain independent maintenance for squadrons in the field.[13] Experience was returning its dividend in terms of realistic recommendations for the future, but the concept of observation seemed to cling tenaciously to the World War I idea of fixed airdromes behind static lines. Not until ground forces actually began to maneuver in large numbers over wide areas of unusual terrain was the idea of liaison aircraft to force itself into acceptance.

As long as tactical units within the Air Corps were limited to a handful of planes scattered over the continent and maneuvers with ground forces were in terms of two's and three's rather than squadrons and

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13. "Report of 4th Army Maneuvers," 1937, Vol. II, VII Corps, Sec. XV, Rept. of Air Officer, in AAG 354.2, Inventory, Vol. I (C).

groups, tactical doctrine was destined to remain nearly dormant. But there were other factors which delayed or at least influenced the evolution of the tactical concept. Lighter-than-air and rotary-wing aircraft absorbed at least a part of the role of observation aviation, and the effort, the funds, and the time devoted to those two classes of aviation sidetracked the growth of conventional observation airplanes. Before considering the progress of the airplane further, it is worth while to consider the balloon and the autogiro.

Chapter IV

LIGHTER-THAN-AIR EXPERIMENTS AND AUTOGIROS, 1930-1940

The Chief of the Air Corps noted in 1930 that the "unsettled state" of the Army lighter-than-air program was chiefly the result of inadequate appropriations.[1] During the previous year something less than $7,000 had been allocated to lighter-than-air out of a total experimental aircraft budget of nearly $250,000.[2] By the end of 1931 there were, in the entire Air Corps, but three airship companies, operating from four to six nonrigid airships, and two balloon companies, one at Fort Bragg, the other at Fort Sill, operating a total of four balloons.[3] On such a limited scale as this, it was inevitable that balloon development would be slow.

In general, Air Corps lighter-than-air followed two lines of activity, the development of the airship and the development of the captive balloon. The enormous vulnerability of the airship when operating away from friendly and protective ground-fire concentrations gave little incentive to perfect the class. The TF-1, a "motorized observation balloon," showed promise enough to be recommended for further development, but since no funds were available, the project made little progress.[4] The very limited scale of balloon operations conducted by

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1. C/AC to TAG, 20 Dec. 1930, in ATSC 400.112, Five Year Program, 1931.
2. C/PD to C/AC, 11 March 1929, in ATSC 400.112, Exp. Eng. Program, 1929.
3. Chief, Eng. Sec., MD to Buhl Aircraft Co., Detroit, 20 Oct. 1931, in ATSC 452.1, Autogiros, 1931-1939. See also TAG to CG, VI Corps Area, 6 May 1930, in ATSC 321.91, Organization of 2d Balloon Co.
4. Board Proceedings on Practicability of Motorized Obsn. Balloon, 3 April 1933, in ATSC 334.7, Motorized Balloon Obsn., 1933.

the Air Corps can be appreciated from the fact that apart from personnel at Forts Bragg and Sill, where the two balloon companies were located, the Materiel Division had but one officer with sufficient lighter-than-air experience to comment on service reports from the field.[5]

In 1934 the TE-3 airship was flight tested and reported as unsafe for "service type flying."[6] In view of the fact that the 1934 budget allocated only $5,000 to experimental work on balloons and airships, little improvement could be expected.[7] The C-3 hydrogen-filled, captive-type observation balloon continued as standard, but some experimental work was carried out with the C-6, a helium-filled, motorized observation balloon.[8]

The observation balloon was used primarily for artillery-fire control, locating targets, regulating fire, and observing results. Because it was fixed in one spot, it provided an ideal platform for observation, but at the same time it had many disadvantages. It was vulnerable to air attack. It could not be flown in a high wind. It could travel cross-country only as fast as the ground winch truck could maneuver, and as late as 1938 this was little more than 10 miles per hour. Wooded areas and overhead electric wires made travel in all but open terrain an impossibility. To operate in closed terrain the balloon had to be deflated, packed, and reinflated at the new observation point. Deflation required

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5. ICM, Chief, Eng. Sec. to Chief, Tech. Data Br., MD, 2 Aug. 1934, in ATSC 400.112, Service Test Obsn. Balloon, 1935.
6. Eng. Officer, Scott Field Air Depot to MD, 24 Oct. 1934, in ATSC 452.3, Airship TE-3, 1938.
7. Exp. Research Program, Subtitle B, FY 1934, in ATSC 400.112, Exp. & Research Program, 1934.
8. MD, "Ninth Annual Report," FY 1935, Pt. II, Eng., in ATSC 319.1, Annual Report, 1935.

two hours; reinflation required two and one-half hours, during which time the artillery would be entirely without observation. Two weeks of maneuvering, folding and unfolding the balloon envelope, wore out the fabric. Obviously the captive observation balloon was impractical for anything but the most static tactical situations.[9]

To overcome the many drawbacks of the C-3 balloon, the C-6 motorized version was developed. It could fly cross-country, avoiding the travel difficulties of the C-3. Having arrived at a new observation post, it could attach a winch cable and take on all the advantages of a fixed balloon in telephonic communication with the ground below. Without special ground-handling equipment, which had not been perfected by 1937, even the C-6 required 50 men for stowing.[10] Nevertheless, as late as 1938 some consideration was given a plan to re-establish the balloon school at Scott Field, Ill., since the C-6 seemed to give lighter-than-air equipment a new lease on life.[11]

In 1938 the British had decided against further use of airships, but as late as July 1940, the Germans continued to operate captive balloons for artillery purposes, according to military attaché reports from those countries. Significantly, however, the attaché at Berlin reported that the Germans anticipated very limited use because of the fluid, maneuvering nature of the war.[12] At about the same time, the

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9. CO, 2d Balloon Sq., Fort Bragg to C/AC, 4 Feb. 1938, in ATSC 452.3, Balloons C-6, 1938.
10. CO, Scott Field to C/MD, 24 July 1937, in ibid.
11. Exec., MD to C/AC, 5 June 1938, in ibid. See also "The Observation Balloon Weighs Anchor," in Field Artillery Journal, XXVII (1937), p. 446, for account of C-6.
12. Military Attaché, London, Rept. 39638, 13 Sep. 1938, in OCAC Info. Div. files 9040, Great Britain, Annual Report, 1938, in AFSHO files. See also Military Attaché, Berlin, Rept. 17397, 16 July 1940, in WF Tech. Data Lib., Great Britain, Attaché Repts., 1940 (C).

Chief of the Air Corps revealed that only the Field Artillery had a requirement for observation balloons, and even the Artillery did not anticipate that these would be used in a war with any first-class power. Shortly afterward, in October 1940, the General Staff directed the Air Corps to reorganize balloon squadrons as barrage balloon units.[13] The day of the liaison aircraft had almost arrived.

The importance of the observation balloon in the evolution of the observation airplane is largely negative. So long as captive balloon observation satisfied the requirements of the Field Artillery for close-range observation, there was little incentive to perfect an airplane substitute for that function. The appearance of the C-6 motorized balloon delayed the transfer of the function by seeming to provide a satisfactory alternative to the obsolete C-3, but the inadequacy of development funds prevented the Air Corps from pressing the experiment to a successful conclusion.

The following chart, including obsolete, standard, and limited standard equipment, gives some idea of the total lighter-than-air strength in the period between the two wars.[14]

Total Number of Lighter-Than-Air Units Available

	Airships	Observation Balloons	Spherical Balloons
1922	13	448	32
1923	9	68	34
1924	7	40	30
1925	10	39	22
1926	14	36	37

13. OCAC to TAG, 11 Oct. 1940, and 1st ind., AGO to C/AC, 30 Oct. 1940, in ATSC 452.1, Mil. Characteristics, Obsn., 1941.
14. Chart by WDGS Statistical Br., 1 Nov. 1938, in ATSC 319.1, Rept. of Major Activities of War Dept., 1929-1941.

	Airships	Observation Balloons	Spherical Balloons
1927	20	30	32
1928	12	29	27
1929	11	27	35
1930	14	21	25
1931	15	21	25
1932	14	15	27
1933	13	6	25
1934	8	4	20
1935	7	6	20
1936	7	7	24
1937	6	7	25

Like the balloon, the rotary-wing aircraft is important in a negative sense in the evolution of observation airplanes, for every observation function allocated to rotary-wing aircraft removed the incentive to perfect an airplane to do the same thing. From its very inception the rotary-wing aircraft type, including both helicopters and autogiros, was considered for use as a military weapon. As early as 1915 an Austrian army officer tried to perfect a military helicopter. In 1918 the project was pushed vigorously to replace the captive balloon for aerial observation in trench warfare and for use at sea with battleships. The French government subsidized similar experiments during and after World War I, but without exception all experiments were practical failures.[15]

The Engineering Division at McCook Field showed a continued interest in rotary-wing developments from 1921 onward, especially after the successes of deCievra in Spain. In 1928 the Military Attaché for Air in London flew in an autogiro built by the A. V. Roe Company and reported that while it might make a good, safe airplane for civilian use, "for

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15. Military Attaché, France, Rept. 3541-W, 27 Jan. 1921, in ATSC Central files, McCook files, Helicopter.

military purposes the autogiro seems to have no promise at all in its present state of development."[16]

In 1930 demonstrations of autogiros in the United States aroused Field Artillery interest in rotary-wing aircraft for possible use as an aerial observation post. The Office of the Chief of Field Artillery asked the Materiel Division for a report on the subject.[17] The Materiel Division attitude was expressed by the Engineering Section chief: "This type of aircraft may have some value as an observation post and may be desirable in cases where no satisfactory landing field is available for an airplane, but it is not at present contemplated for any military purposes." Specifically, the Materiel Division objected to the low weight-lifting capacity of the rotary-wing aircraft, and funds were lacking to press development to overcome this objection.[18] As long as the type remained unsatisfactory, no adequate tactical tests could be carried out, and until tactical utility could be proved, there was little likelihood that the type would be given any generous allocation of experimental funds.

In 1932 a military attaché in France reported that the French were using autogiros as messenger aircraft in the maneuvers at Champagne, but this significant information caused no unusual comment in Air Corps circles.[19] A year later, however, when the Navy purchased a Pitcairn

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16. Maj. H. B. Harmon, Military Attaché for Air, London, to Chief, Info. Div., OCAC, 11 Jan. 1928, in ATSC 452.1, Pitcairn Autogiro, 1940.
17. Exec., OCFA to C/AC, 14 Oct. 1930, in ibid.
18. Actg. Chief, Eng. Sec., MD to United Aircraft, 22 Jan. 1931, and Chief, Eng. Sec., MD to C/AC, 13 Dec. 1932, in ibid.
19. Chief, Info. Div., OCAC to C/MD, 11 Oct. 1932, in ATSC 452.1, Autogiros, 1939.

autogiro for use with the Marine Corps troops in Nicaragua, the General Staff took the initiative in directing the Air Corps to consider the question of the autogiro's tactical utility.

The several chiefs of the arms and services indicated that they were generally in favor of the autogiro as a substitute for the captive balloon. The Field Artillery regarded the autogiro as superior to the captive balloon; the Cavalry wanted autogiros for scouting with mechanized cavalry units; and the Surgeon General believed that autogiros would prove valuable as ambulances for inaccessible crashes. Despite these favorable opinions, the Air Corps rejected the autogiro as a military weapon, and the Chief of the Air Corps, at that time Maj. Gen. B. D. Foulois, found himself in the peculiar position of defending lighter-than-air against an aircraft type.

Air Corps opinion disputed the Field Artillery contention that the autogiro was superior to the captive balloon. In fact, it was held that the autogiro was not even a "good substitute" for the balloon. Moreover, the Air Corps was confident of the utility of the captive balloon and the observation airplane. "Each in its own field has been and still is eminently satisfactory. . . . This office has yet to hear of a serious complaint from any combat branch in regard to the capabilities of either the airplane or the balloon or that either was not furnishing satisfactory service." Such confidence is impressive even though it may have been unwarranted.

An Air Corps report pointed out that the experience of World War I indicated that only 17 per cent of all balloon observation pertained to artillery observation, yet all the arguments deduced against the autogiro

were criticisms of its function as an artillery observation post. After noting that the autogiro was scarcely out of the toy stage, the Air Corps spokesman pointed out that by the use of "slots and flaps and brakes, airplanes are able to operate from smaller fields than ever before," and for this reason the airplane was approaching the landing and take-off characteristics of the autogiro. As for the boasted slow flying speed of the autogiro, the analysis somewhat illogically continued: "The so-called advantage of low flying speeds has little military application."

The report, signed by the Chief of the Air Corps, summarized the Air Corps attitude on autogiro development and concluded that in its existing state of development there was no military use for the autogiro, that the motorized balloon would largely overcome the objections raised to captive balloons, and that observation airplanes, costing no more than autogiros, could perform a wider scope of missions. The Chief of the Aircraft Branch at Wright Field as well as the Lighter-than-Air Unit Chief agreed with the OCAC report. For all practical purposes it appeared that the Air Corps was ready to kill off the autogiro, since the OCAC report declared of the motorized observation balloon: "Further development of this type is believed to be far more logical than further experimentation with the autogiro."[20]

The autogiro, however, would not be killed off. Six months later the President of the United States directed the Secretary of War to encourage experiments using the autogiro with the Cavalry, Infantry, and Field Artillery; and the Secretary of War in turn directed the Chief of

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20. Capt. F. E. Pierce, USMC to Commandant, 6 Nov. 1933; and TAG to C/AC, 19 Dec. 1933, with 1st ind., 15 Jan. 1934, and WF buck slip. All in ibid.

the Air Corps to initiate projects with autogiros at the three service schools.[21] From this time onward, whatever objections the Air Corps may have had towards autogiros, it was not allowed to stop development on rotary-wing aircraft projects. The Materiel Division drafted tentative military characteristics and type specifications for the rotary-wing type in order to give autogiro and helicopter manufacturers a specific objective toward which to strive.[22]

Reports from outside the United States indicated that other military powers were not ignoring autogiros. The Soviet Union, France, Spain, Japan, Italy, and Germany had all displayed an active interest, and in Great Britain autogiro trials run by a number of general officers, including Gen. Sir Archibald Wavell, had demonstrated the value of the autogiro for personal reconnaissance by staff officers behind friendly lines and for transporting unit commanders to and fro between various headquarters, as well as for artillery spotting and other close observation work. At the Materiel Division there was an inclination to ignore or discredit these reports as inspired by the autogiro manufacturers. Nevertheless, subsequent, if tardy, reports from military attachés in Great Britain were to confirm the earlier information.[23]

The Materiel Division reported in 1935 on the status of division opinion and progress regarding autogiros: "The autogiro is receiving consideration for military use for the first time. A definite requirement

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21. TAG to C/AC, 11 June 1934, in ibid.
22. Memo Rept. AG-51-22, 26 June 1934 and Type Spec. Y-1776, 15 Sep. 1934, in ibid.
23. Undated memo, Kellet Autogiro, in ATSC 452.1, Kellet Autogiro, 1941. Note caustic marginal notations made at MD.

for this type of machine exists, but at the present time no machines are available to meet the requirements."[24] The Air Corps could scarcely take any other stand in view of the directive received through The Adjutant General. After noting that the rapid strides in autogiro development had given rotary-wing aircraft a "decided advantage" over more conventional observation airplanes and the captive balloon for use in conjunction with ground troops, the directive ordered engineering to be expedited and service tests to be planned to determine the ideal use of rotary-wing aircraft with ground force units.[25]

Nothing could indicate the shift from lighter-than-air to autogiros quite so pointedly as a Materiel Division report in October 1936, that inasmuch as experimental funds were limited, it would be necessary to use funds originally allocated to balloon projects in order to pursue autogiro development.[26] But so far as the concept of observation aviation was concerned, the trend toward autogiros was even more important because it seemed to clarify the pattern of the many functions included in the term observation. The Chief of the Air Corps reflected this trend in writing to the Materiel Division:[27]

> With the mechanization of the Army, the actual reconnaissance by the staff has been slowed up relatively to such an extent that the increased speed of mechanization is almost if not entirely lost. The autogiro is looked upon by some authorities as possibly being the replacement for the horse for reconnaissance purposes.

In Great Britain the trend toward enlarging the tactical functions of the autogiro was already well under way. Interestingly enough,

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24. MD, "Ninth Annual Report," FY 1935, in ATSC 319.1, Annual Rept., 1935.
25. TAC to C/AC, 27 Nov. 1935, in ATSC 452.1, Autogiro, 1939.
26. Memo Rept. 50-204, 26 Oct. 1936, in ibid.
27. C/AC to MD, 7 Jan. 1936, in ibid.

British use stressed liaison, courier, and command reconnaissance rather than the artillery fire-control function. The Air Ministry and the RAF, like the Air Corps, were not inclined to favor the unconventional aircraft. The War Office, however, was enthusiastic: "Nothing offers so promising a vehicle, especially during a war of maneuver." Official opinion saw the autogiro as useful for "urgent and temporary" tactical observation as well as for the usual courier and liaison functions behind friendly lines.

The War Office realized that it would be necessary to train staff officers and unit commanders to use the autogiro to the maximum, but considered that future technical improvement would do away with previous complaints and hesitations. In short, substantially the same situation prevailed in Great Britain as in the United States. The RAF was pessimistic about the future of rotary-wing aircraft and not anxious to allocate experimental funds to its development, while the ground forces were eager to push the project as far as possible even if it meant working independently of the RAF.[28]

Whatever may have been the influence of British practice on military circles in the United States, the importance of the autogiro was not underestimated after 1936. During the next year Brig. Gen. Lesley J. McNair, writing in the Field Artillery Journal, put the problem squarely before the military world: the autogiro, he said, represented something radically new; it must be evaluated and integrated to the limit of its capacity in military doctrine and practice.[29] Throughout the following

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28. Military Attaché, London, Rept. 38323, 28 Oct. 1936, in OCAC Info. Div. files, 9570, Great Britain, Armament, in AFSHO files.
29. Brig. Gen. L. J. McNair, "And Now the Autogiro," in Field Artillery Journal, XXVII (1937), p. 5.

three years the autogiro actually was tested extensively with the Infantry, Cavalry, and Field Artillery. General McNair's admonishment was observed. The importance of the trials lay not so much in the ultimate decision of whether or not the autogiro was acceptable, but in the fact that the trials in themselves represented an honest attempt on the part of the tactical arms to experiment tactically with a novel weapon.

By the end of 1938 the several service schools had accumulated extensive tactical experience with the autogiro. Fort Benning reported on 110 flights in conjunction with ground maneuvers. Fifteen flights were flown with the artillery units at Benning alone. After many co-operative exercises with tanks, field artillery, and infantry, the services reported that it was difficult to reach a decision on the relative value of the autogiro and the conventional observation airplane without extended and continuous field experience. There seemed to be general agreement, however, that the autogiro was superior for close, tactical observation as well as for staff and command liaison in friendly areas, while the observation airplane was superior for reconnaissance over hostile territory. The experiments led the services to conclude, moreover, that "vision from a light, slow speed airplane should be equal to that from an autogiro," and as far as the Infantry was concerned, that the primary advantage of the autogiro over the conventional airplane was its ability to land and take off from restricted areas.[30]

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30. OCAC to CO, AC Troops, Fort Sill, 30 Aug. 1938; AC Troops, Fort Sill to OCAC, 2 Nov. 1938; and CO, AC Troops, Fort Benning to OCAC, 10 Dec. 1938. All in ATSC 452.1, Bimonthly Rept. on Autogiro Opn., 1940.

The fate of the autogiro was of relatively little moment in comparison to the significance of the tactical lessons impressed upon the ground force organizations using the new weapon. Since the autogiro had been tried and found useful even within the limitations of its as yet undeveloped structure, there was but a short step beyond to the use of conventional airplanes having characteristics comparable to those of the autogiro. And since it had been discovered that a slow-flying aircraft capable of landing in restricted areas in the immediate vicinity of troops was of exceptional tactical utility, in a very short time the ground forces were calling for a light, slow-speed airplane to compare with the autogiro. Fort Sill suggested the development of such a slow-speed airplane performing comparably to the autogiro with the added advantages of easier maintenance, easier pilot training, and more extended tactical scope, not to mention the factor of increased load capacity. A Coast Artillery Board report from Fortress Monroe echoed the Fort Sill recommendation.[31]

Although observation-type autogiro "military characteristics" were prepared for The Adjutant General's formal approval and record, it is significant to note that Expansion Program procurement plans did not include autogiros because it was believed that no autogiro had as yet progressed from the experimental to the production phase.[32] The autogiro served its purpose in pointing the way toward the use of slow-flying aircraft; then quickly reverted to its experimental status. In July 1939

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31. Actg. C/AC to TAG, 27 Jan. 1939, and 1st ind., TAG to C/AC, 13 Feb. 1939, in ATSC 452.1, Mil. Characteristics, 1939.
32. CO, AC Troops, Fort Sill to OCAC, 6 April 1939, in ATSC 452.1, Bimonthly Rept. on Autogiro Opn., 1940; "Report of Coast Artillery Board on Project No. 1135," 21 June 1939, in ATSC 452.1, Board Report, 1939.

plans were well under way at the Materiel Division to procure three observation airplanes from each of the first three competition winners in a design competition for slow-flying, short-range airplanes.[33] The evolution of the slow-flying airplane represents a study in itself, dating back long before the autogiro appeared as a tactically useful weapon.

33. Lt. M. D. Burnside to C/MD, 20 July 1939, in ATSC 452.1, Autogiros, 1939.

Chapter V

LIGHT PLANES AND SLOW PLANES, 1929-1938

The history of Air Corps interest in light airplanes dates back as early as 1929, when the Materiel Division conducted an extensive survey to determine the possibilities of using light commercial aircraft in lieu of existing specialized training equipment. Despite the fact that 40 manufacturers expressed an interest in the project, the division found only one model which was at all suitable. All others contained objectionable features, for the most part structural members which did not conform to Army-Navy materials specifications. Taken collectively, the utter lack of standardization and interchangeability presented a most serious objection to the use of commercial aircraft for military use, and the division gave up the idea.[1]

One of the manufacturers of light-weight airplanes, the Taylor Aircraft Company, had no intention of abandoning the military market for training airplanes. Writing to the Assistant Secretary of War for Air late in 1931, Taylor pointed out that light-weight airplanes had dropped in average price from $5,000 to $3,500 between 1930 and 1931 and predicted that in another year the light airplane would be outselling all other types. Stressing the favorable economy of cub airplanes selling at $1,325, Taylor urged the War Department to consider the cub as a

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1. Exec., LD to C/AC, 11 April 1929; Lt. W. H. Brookley to Chief, EES, 14 Dec. 1929; Chief, Airplane Br. to Chief, EES, 14 March 1929. All in ATSC 452.1, Commercial Airplanes for Training, 1939.

trainer, saying: "If some of these Army contracts were passed around to the manufacturers of light airplanes, it would greatly strengthen their position."

The Materiel Division had no interest in strengthening the position of light-airplane manufacturers, and brushed off the Taylor proposition with the remark that parachutes and heavy, winter flying equipment made the use of small airplanes impossible. Just why cadets in preliminary flying training should be wearing heavy flying clothing was not explained, but the division reply was emphatic, that the small airplane had no place in the Air Corps training program.[2]

When Taylor renewed the attempt to sell the idea of light training airplanes in 1935, the Materiel Division replied that the "present program" did not call for light airplanes, that all airplanes were procured in competitions, and that the division would be glad to include Taylor on the list of manufacturers receiving circular proposals. The manufacturer pointed out that there had been no intention of competing with existing standard equipment. Taylor had hoped to interest the Materiel Division in a project to experiment with light-weight airplanes for preliminary training quite apart from existing practices.[3]

The Baker Board in 1934 recommended the use of small, inexpensive, "non-military" airplanes for training purposes. The Assistant Chiefs of Staff G-3 and G-4 and the Chief of the Air Corps disagreed with the

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2. Taylor Aircraft to AS/W, 20 Nov. and 15 Dec. 1931; Exec., MD to Taylor, 15 Dec. 1931. In ATSC 452.1, Taylor Cub, 1935. Price data were taken by Taylor from a bulletin of the Aeronautical Chamber of Commerce in America.
3. Chief, Procur. Sec. to Taylor, 9 March 1935; Taylor to MD, 16 April 1935. In ibid.

report, but the Chief of Staff pointed out, by way of comparison, that the Coast Artillery used subcaliber practice guns successfully and directed the Air Corps to investigate the use of light training airplanes.[4]

The Materiel Division had marshaled a number of arguments against this directive. Light airplanes introduced increased supply problems; they could not carry the "necessary equipment"; they did not conform, in general practice, to Army standards in strength factors, flying characteristics, etc.; and finally, they could not be put to "military use."

It was not until 1938 that the Air Corps pressed the question further. General Westover, then Chief of the Air Corps, raised the issue once again, in noting that commercial flying schools were using light airplanes successfully. The Materiel Division took steps to procure a number of commercial models "off-the shelf" to test them experimentally at the Training Center. Type specifications were prepared, and the division circularized the commercial flying schools to garner all available information on the use of light airplanes.[5]

It is significant that more than 10 years earlier the British had begun using De Havilland Moths with 80 hp. engines as an economy measure in trainer airplanes. Something of the prevailing attitude in military circles is reflected in the report of the Military Attaché in London that "These planes have no tactical value, but are intended for communications

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4. Memo for C/AC by C/S, 2 Oct. 1934, and 2d ind., MD to C/AC, 10 Oct. 1934; memo for C/AC by AC/S, [G-4?], 2 Oct. 1934. In ATSC 452.1, Commercial Aircraft for Training, 1939.
5. TWX, Westover to MD, 19 March 1938; TWX, Echols to Westover, 22 March 1938; Memo Rept. TR-51-264, 26 Sep. 1938; Actg. Chief, Eng. Sec. to Curtiss-Wright, Tech. Inst., 25 March 1938. In ibid.

and transportation purposes."[6] World War II experience was to demonstrate how wrong that opinion had been, and the attitude represented by such expressions was to account for the fact that the Materiel Division was forced to accept partially satisfactory airplanes when tactical requirements made large-scale procurement of light airplanes an urgent necessity. In Europe, however, the light airplane had long been accepted as a military instrument.

Reporting on the French Army exercises of 1932 the Assistant Chief of the Air Corps noted that "the important feature of the maneuvers, from an aeronautical point of view, was the use of reserve personnel." Small, touring aircraft, piloted by their owners, members of the air reserve, were used for staff and command liaison agents and couriers. Government bonuses and subsidies encouraged owners of light airplanes to participate.[7]

It was no accident that the French were using light airplanes as well as more conventional, high-performance aircraft. French military doctrine encompassed the utilization of light airplanes. An engineer writing in l'Aerophile in 1935 called speed the "queen quality of aviation" in all save observation and army-cooperation aircraft, where other factors were more important.[8]

The course of instruction for French air units assigned to the army corps considered the specific problem of observation equipment in detail. After noting the disparity between the absolute necessity of close

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6. Military Attaché, London, Rept. 20996, 17 Jan. 1928, in OCAC Info. Div. files, 9570, Great Britain, Armament, AFSHO.
7. Asst. C/AC to TAG, 23 Feb. 1932, in ATSC 400.112, Exp. Research and Levelopment Program, 1932.
8. "Les Programmes de Materiel," in l'Aerophile, special military number, 1935.

liaison between command posts and observation airplanes and the improbability of finding adequate airdromes for high-performance aircraft in the vicinity of command posts, the French text suggested the feasibility of utilizing light, unarmed, staff airplanes to help take over the forward-area liaison function.[9]

In Germany too there was general recognition of the importance of light airplanes. In fact, the Germans had gone so far as to perfect a special, slow-flying airplane capable of extremely short-run take-offs for the express purpose of forward liaison and observation. In September 1937, the U. S. Office of Naval Intelligence quoted the Volkischer Beobachter account of an episode in the German infantry maneuvers at Stevenhagen, east of Lake Malchin, where Generals Milch and Udet flew up in a Fieseler Storch which landed in a 20-meter run. General Udet described the machine as "the airplane with the record for slow speed." Its "unsurpassed" landing qualities made it independent of an airdrome, a quality which, in conjunction with its potential high speed for escaping hostile attack, led the German paper to comment: "One can easily imagine how important this new construction will be for the tactical scouting flight."[10] Easy as it may have been for the Germans to imagine a light, unarmed, slow-flying airplane in a tactical role, there were a number of military minds which found such a thing extremely difficult to visualize.

The Storch, the German Air Force's Fi-156, was built by the Fieseler

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9. Military Attaché, Paris, Rept. 22, 300-W, 10 March 1936, in OCAC Info. Div. files, 9130, Corps Aviation, France, AFCHO.
10. ONI Report, R-637, 27 Sep. 1937, in ATSC 452.1, Fieseler Storch, 1939. Fieseler is sometimes spelled Fiesler.

Flugzeugbau at Kassel-Bettenhausen. It was a three-place, tandem, steel-tube airframe powered by a 250-hp. Argus engine. Its wings, spanning approximately 48 feet, could be folded back for road travel and ground concealment. Despite the fact that the airplane had a low speed of only 32 m. p. h., its high speed was around 115 m. p. h. A wing loading of 9 1/2 pounds, in conjunction with slots and flaps, made possible landing runs conservatively estimated at 92 feet, a high figure in the light of eyewitness accounts of the Storch's performance. All this information which had been gathered by Naval Intelligence became of peculiar significance in view of the reported military use which the Germans were making of the new airplane as a liaison aircraft for tank corps commanders, for artillery fire control, and for road control of mobile trains.[11]

There was nothing exceptionally covert about German plans for using the Storch. It was demonstrated at the International Aviation Meet in Zurich, where Fieseler himself flew the airplane in competition with autogiros to show that it could land and take off in a shorter run than that required by the typical autogiro. The tactical potentialities of the Storch may have been realized by the Germans, but the U. S. Military Attaché in Paris was unimpressed. He commented: "A useful communication aeroplane, but not of great interest beyond this; a sort of Gugnunc, as far as I can judge, with no really original features."[12] If the Attaché spoke disparagingly, the Germans were not listening. In

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11. ONI Report R-541, 10 Aug. 1937, and MID Report 406, France Aviation (undated extract), in ibid.
12. MID Report 9570, Germany Aviation (undated extract), in ibid. The Gugnunc was a so-called "safe airplane" contemporary with the Guggenheim Competition winner, the Curtiss Tanager.

1937 there were 120 Fi-156 "observation airplanes" on contract. In 1938, 50 of these airplanes had been delivered and Fieseler was producing them at the rate of one a day. The model was still in production in 1939, when the Storch was used extensively in the Polish campaign.[13]

If the attaché at Paris failed to see the importance of the Storch, its implications were not entirely lost on those who studied intelligence reports in the United States. The General Staff informed the Chief of the Air Corps that although foreign observers had indicated that autogiro tests were proving disappointing, the German Air Force had been successful in developing a slow-flying airplane with military characteristics approximately equal to the autogiro characteristics approved by The Adjutant General in August 1936. The Materiel Division was confident that it would be possible to develop such an airplane along conventional lines, using accepted and proved principles.[14]

Slow-flying airplanes were not unknown in the United States. The Guggenheim Safe Airplane Competition winner of 1930, the Curtiss Tanager, a conventional airplane with slots and flaps giving it a speed range between 30 and 110 m. p. h. with a 176-hp. engine, was well known at the Materiel Division, but there was a great deal of difference between knowing of the slow-flying airplane and visualizing its tactical potentialities. When the General Staff directive regarding slow-flying airplanes reached the Materiel Division, a survey was made to compile flight data on 22 light, commercial-model airplanes from such manufacturers as Aeronca, Fairchild, Rearwin, Ryan, Stearman, and Taylor. The results

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13. MID Report 9040, Germany, Annual Report, 1937-39, in OCAC Info. Div. files.
14. TAG to C/AC, 4 Nov. 1937, and proposed 1st ind. by C/AC to TAG, 8 Dec. 1937, in AFSC 452.1, Fieseler Storch, 1939.

were not impressive. Apart from paper claims made by the manufacturers, the performance characteristics fell below those of the Fieseler Storch.[15]

Among the many slow-flying airplanes considered at the Materiel Division, the Crouch-Bolas was perhaps the most novel. The Crouch-Bolas principle, first suggested for pursuit airplanes in 1936, achieved a high degree of lift in power-on landings by passing the slipstream over as large a portion of the wing area as possible. The Crouch-Bolas Dragon Fly, "capable of operating from highly restricted and unprepared areas" over a large speed range, seemed to offer an ideal compromise between the conventional observation airplane and the autogiro.[16]

The Chief of the Air Corps circulated the Crouch-Bolas "courier-observation" airplane idea to the General Staff (G-3 and G-4), as well as to the chiefs of Infantry, Cavalry, and Field Artillery. The consensus of replies to this proposition seemed to favor experiments with the type, but more important, it was suggested that observation squadrons be formed with a small number of high-speed observation airplanes and a large number of slow-flying airplanes. The trend in observation aircraft had already begun to change. Perhaps even more important, the Chief of Cavalry went so far as to break with accepted doctrine in noting that the slow-flying airplane need not have armament. He visualized mechanized warfare in which staff officers, observing from the air, would actually land near congested road columns to give instructions.[17]

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15. Alternate version of 1st ind. above, 27 Nov. 1937, and Memo Rept. 50-254, 5 Jan. 1938, in ibid.
16. Reed G. Landis (Crouch-Bolas) to Chief, Eng. Sec., 31 March 1937, in ATSC 452.1, Crouch-Bolas Principle, 1939.
17. C/AC to AC/S, G-3, G-4, and Chiefs of Field Artillery, Infantry, and Cavalry in turn, 28 Dec. 1937, with inds. 1 thru 4, in ATSC 452.1, Fieseler Storch, 1939. See also TAG to C/AC, 25 Jan. 1938, in AAG 452.1A, Obsn.

The Materiel Division did not favor the Crouch-Bolas principle. Reiterating an earlier statement, the division agreed that it would be wiser to develop a slow-flying airplane along conventional lines after proved principles. Such an airplane could be procured, the division claimed, within a year, while it would take "at least two years" to develop an airplane along Crouch-Bolas lines. This attitude was primarily a result of the conclusion that the principle of power operation in the low-speed range would be fundamentally unsound.[18] The Dragon Fly idea, like the autogiro experimentation, did not entirely lead up a blind alley, however, for despite the fact that no immediate procurement resulted from the project, the interest expressed by the ground arms was probably worth the discussion.

By the end of December 1937 it was apparent that whatever promise the autogiro might hold for the future, it was not at the moment sufficiently perfected to be put into production. Unfortunately, few funds were available to press experimental work vigorously. A similar situation prevailed in the case of the slow-flying airplane. The type held great promise, but no single model had been perfected for military use, and in 1937 the fiscal future, as far ahead as 1939, offered no funds for development work. The Chief of the Supply Division suggested that $100,000 be earmarked in FY 1940 funds to develop the "light courier type," in line with existing policy which contemplated service testing the autogiro in competition with the slow-flying airplane. This plan

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18. MD to C/AC, 27 Nov. 1937, in AISC 452.1, Fieseler Storch 1939. See also, C/MD to Reed G. Landis, 21 Feb. 1939, in AISC 452.1, Crouch-Bolas Principle, 1939.

anticipated a decision between the two by 1942, when a production-model competition could be held for the most suitable type.[19] This was sound and progressive planning in terms of normal peacetime Air Corps developments, but in Europe the tempo of progress was no longer normal.

The technical assistant in Europe of the National Advisory Committee for Aeronautics (NACA), J. J. Ide, continued to prove his worth by confirming and supplementing the information of the attachés. After describing in detail the Fieseler Storch with which the Germans "startled the Zurich Meet," Ide identified a significant European trend when he stated: "High performance army cooperation and observation airplanes are almost non-existent."[20] The direction of observation-airplane development had already been set in Europe, but nearly two years were to pass before the impact of this trend would strike with all its implications in the United States.

The Storch, however, continued to influence thinking in military circles. On learning of Materiel Division interest in slow-flying airplanes, the director of aeronautical research of the NACA sent the Engineering Division chief a copy of a Handley-Page bulletin on the Fieseler airplane. At about the same time intelligence reports revealed that German Panzer divisions anticipated attaching Storch observation squadrons to the Panzer organization, consisting of 11,000 men and 3,000 vehicles.

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19. R&R, Actg. Chief, T&O Div. to Exec. OCAC; memo for C/AC by Chief, Supply Div.; R&R, Chief, Plans Div. to C/AC. All on 22 Dec. 1937, in ATSC 452.1, Fieseler Storch, 1939.
20. J. J. Ide, Technical Asst. in Europe for NACA, "Notes on European Aeronautical Development in 1937," 7 Jan. 1938, in ATSC 461, Foreign Information, 1939.

Perhaps the most telling influence of the Storch came somewhat later when a Fieseler model flew at the Cleveland Air Races in competition with an autogiro. Materiel Division representatives were so much impressed by personal observation of the Storch in action that the division chief asked OCAC to arrange for the aircraft to be brought to Wright Field where the airplane was inspected in detail by Aircraft Laboratory personnel.[21] The Storch's performance was convincing, but even before it came to Wright Field, the Materiel Division had been perfectly willing to admit its tactical value.

By the end of January 1938 the Materiel Division suggested that there seemed to be no need for a formal design competition of slow-flying airplanes, since physical articles approaching the desired characteristics were already available. In line with Expansion Program policies, the division recommended that a circular proposal be prepared for a production model slow-flying airplane if funds could be found somewhere in 1939 allocations.[22]

Probably the real landmark in the evolution of observation airplanes came in March 1938 when The Adjutant General formally approved the Air Corps' military characteristics for the observation airplane, a "short range liaison" type, a two-place single-engine aircraft with an assigned mission of artillery fire control and liaison function for ground commanders.

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21. Dir. of Aero. Research, NACA to Lt. Col. O. P. Echols, 5 Feb. 1938; TWX, MD to OCAC, 7 Sep. 1938; and MD Press Release on Storch at Wright Field, 12 Sep. 1938. In ATSC 452.1, Fieseler Storch, 1939. See also MID summary of Military Attaché, Germany, Rept. 15596, 13 Jan. 1938, in OCAC Div. files, 9140, Germany, Div. Aviation (C).
22. TAG to C/AC, 4 Nov. 1937, and 4th ind., MD to C/AC, 27 Jan. 1938, in ATSC 452.1, Mil. Characteristics Airplanes, Obsn., General, 1938.

It was contemplated that performance characteristics for the new type would include a speed range from 40 to 125 m. p. h., the ability to clear 50-foot obstacles in a run of 500 feet or less, and, most significantly, no armament.[23] The World War I heritage of observation aviation was beginning to break down into its component functions. From this point on, the development of liaison aircraft became a foregone conclusion, but a great distance lay between the decision to develop the type and the actual tactical use of the type in large quantities by service units during World War II.

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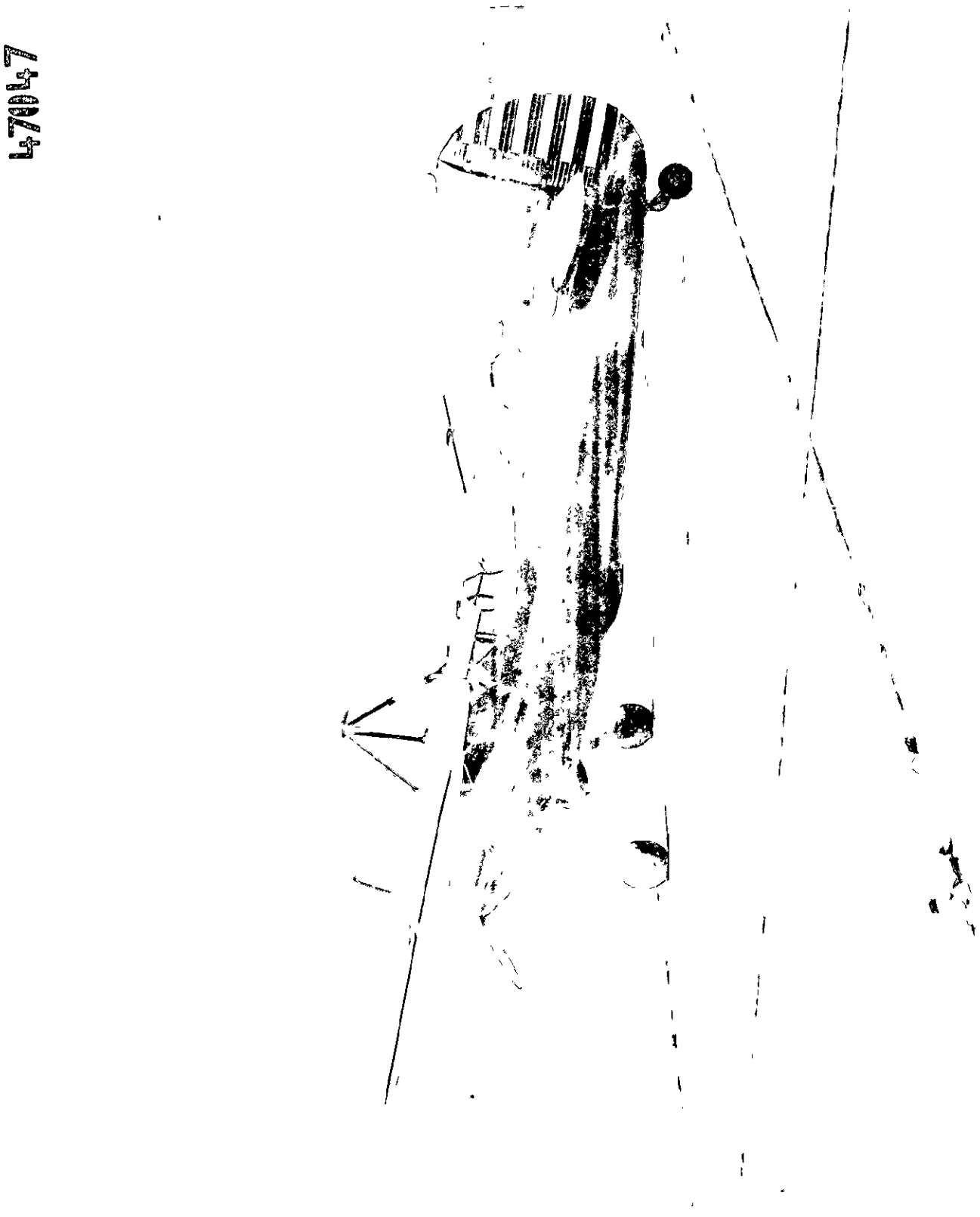
23. CCAC to TAG, 14 March 1938, and 1st ind., TAG to C/AC, 30 March 1938, in ATSC 452.1, Mil. Characteristics Airplanes, Obsn., General, 1938.



Chapter VI

THE O-49, FIRST OF THE LIAISON AIRPLANES, 1938-1940

General Arnold touched on the very core of the observation airplane problem when he said, in an address before the Society of Automotive Engineers in November 1938: "This type has now reached a point where, due to its high performance, it is unsuitable for some close support missions." The gradual but continual progress in aviation since World War I had brought about a change which made inevitable a drastic alteration of observation airplane policy. The relatively low-performance airplanes of the earlier war had been able to perform such extremes in function as infantry liaison and tactical reconnaissance deep into hostile territory, but during the following 20 years, as speeds increased, the multipurpose observation airplane became an anachronism. The trend of thinking was clearly defined when General Arnold said: "Those of you who saw the exhibition at the Cleveland Air Races join me in believing that these slow speed liaison airplanes may prove to be more practical than the autogiros which the Army is now service testing."[1]

In all probability, the Air Corps' failure to perfect the organization and equipment of its observation squadrons was a direct result of the lag in shaking loose from the World War I concept of aviation as a tactical adjunct of the ground forces and in establishing airpower as an independent, strategic weapon. It was almost inevitable that the

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1. Gen. H. H. Arnold, "Trends in Aircraft and Engine Performance," lecture before Society of Automotive Engineers, 26 Nov. 1938, in ATSC 350.001, Lectures, Gen. Arnold, 1941.

effort to enlarge the strategic role of air power should lead to the neglect of army-cooperation and observation functions. Almost exactly the same difficulties appeared in France and England, where the creation of separate air forces developed a whole series of similar liaison problems.[2]

By 1938, however, the Air Corps could no longer neglect the question of observation aviation. Even if the current of events in Europe had not forced the development of slow-flying airplanes, a General Staff directive made it mandatory for the Air Corps to concentrate on army-cooperation equipment. After pointing out that the infantry division continued to be "the basic combat element by which battles are won," the General Staff directive stressed the fact that the Air Corps was to press the development of equipment "for the close support of ground troops to the same extent that now pertains with respect to types suitable for strategic and more distant missions."[3] Between pressure from the Army and the spectacular performance of the Fieseler Storch, the Air Corps could scarcely avoid the decision to speed the perfection of liaison aircraft.

Nevertheless, the decision to develop a slow-flying airplane did not in itself solve the problem of liaison aircraft. Before an effective combat weapon could be perfected, it was essential to work out the details

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2. Military Attaché, Paris, Rept. 20849-W, 9 Oct. 1934, reprint of article in L'Air, probably written by General Berger. In ATSC Central files, Executive Correspondence, Procur. The problems of army-cooperation raised by the separate air forces are treated extensively in aviation periodicals in the United States, France, and Great Britain throughout the between-war period.
3. C/AC to TAG, 31 Aug. 1938, and 1st ind., TAG to C/AC, 5 Oct. 1938, in ATSC Central files, 1938, Air Corps Program and Directive (C).

of its use, especially the organization of which it would become a part, since the nature of the organization would, in a large measure, determine the aircraft's design. Equipment suited to Air Corps use, operating primarily from bases with maintenance facilities, might well fall short of the equipment required for cow-pasture operation with but the barest of first-echelon maintenance performed by the pilot.

Moreover, the question of design was further complicated by the question of operation. The using arms--the Field Artillery, the Cavalry, and the Infantry, as well as the mechanized and armored forces--were convinced that Air Corps observation squadrons could not provide adequate liaison service because they were not integral parts of the ground force team and lacked the ground force point of view. This school of thought held that only by making the liaison units organic parts of the ground force troops which they served could they perform maximum service. This problem of organic versus detached organization was to vex the Air Corps and ground forces for months to come, but of immediate significance to the development of materiel was the fact that the nature of the organization of liaison units would have an important bearing on the design of the airplanes themselves. Any complications such as adjustable-pitch propellers, intricate flight instruments, etc. implied maintenance and pilot-training problems which almost necessarily required Air Corps organization.

Every month of delay in reaching a decision in the matter of the operation and organization of light aircraft was to cost the Air Corps heavily when the time came for quantity procurement. The go-ahead on light airplanes was officially expressed in a circular proposal (C.P. 39-2)

inaugurating a design competition for "short range liaison observation" airplanes, a competition which was scheduled to close on 23 February 1939. This invitation for bids marked a definite step forward, but at the beginning of 1939 actual production on the type stretched out into an indefinite future.[4]

The Materiel Division anticipated a development program in 1940 and 1941 which would produce an improved corps and division observation airplane "based on a compromise" between the requirement for liaison airplanes and the existing corps and army observation type. But the Materiel Division's plans were only plans. At the time, during the first half of 1939, Air Corps observation squadrons were entirely equipped with corps and division airplanes nearly three years after the decision to divide observation into army reconnaissance, corps and division observation, and corps and division short-range observation.[5]

Something of the confusion of concept which persisted after the introduction of the light airplane type is indicated in the complexity of type terminology in the observation class. Within the compass of the term observation came the reconnaissance airplane, a long-range strategic weapon; the army and corps and division airplane, sometimes called the corps and army airplane; and the short-range liaison airplane. The Materiel Division favored the designation "low speed liaison" to "short range liaison" because the airplane represented a "distinctly different type as to size,

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4. C.P. 39-2, in letter from Contracting Officer, MD to Airplane Designers and Manufacturers, 23 Aug., 1938, in Case History, "Liaison Aircraft Program," (S), ATSC Hist. Office.
5. C/MD to C/AC, 24 March 1939, in ATSC Central files, Expansion Program, 1939 (C). See also Record Sheet by Brig. Gen. G. P. Tyner, 2 March 1939, in G-4 files, 27227-12, AGO MD Rec. Br., Classified Sec.

performance, mission and purpose," but OCAC promised to reach a decision between the two phrases only "when and if the development of the proposed Short Range Liaison airplane" was successfully completed.[6]

By the end of 1938 observation aviation as a class included the corps and army single-engine, three-place airplane designated "O"; the corps and division short-range, single-engine, two-place airplane designated "OL"; the corps and division single-engine autogiro or rotary-wing aircraft designated "OG"; the army reconnaissance twin-engine, multiplace airplane designated "R"; and two types of amphibians.[7] If all these designations seemed to cloud the true picture of observation aviation, the time had come when the confusion of terms was to disappear.

In May 1939 a board of officers selected to determine the military characteristics of short-range observation airplanes reaffirmed the earlier three-way division of observation aviation functions: army reconnaissance high-speed, twin-engine, attack-bomber types; corps and division single-engine, armed observation airplanes for "shallow penetration" over hostile areas; and liaison airplanes for command use, liaison, courier, and artillery fire-adjustment missions.

The board's conclusions, while merely echoing a previously developed philosophy, were important for several reasons. They gave specific definition to the growing concept of segregated observation. Moreover, the board was truly representative, including National Guard, Air Corps, Infantry, and Field Artillery representatives. The board received

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6. OCAC to TAG, 19 Feb. 1938, with 1st ind., MD to C/AC, 10 March 1938, and 2d ind., OCAC to MD, 16 March 1938, in ATSC 452.1, Mil. Characteristics, Obsn. and Recn., 1938.
7. These designations were drafted by OCAC for TAG about August 1938. See ibid.

testimony from those services, as well as reports from the Coast Artillery, GHQ Air Force, observation squadrons at Forts Knox, Riley, Benning, and Sill, and Materiel Division personnel. Most significant of all was the statement of General Arnold, made during the board's deliberation: "I feel you [the ground forces] should determine more of the character of this vehicle than we because we have to secure the information that you want. We have to please the customer, and you are the customer."

The attitude typified by General Arnold's statement was followed by a concrete expression of cooperation in the military characteristics proposed by the board for the short-range liaison airplane, a single-engine, high-wing, two-place, unarmed airplane with a speed range of 40 to 125 m. p. h. capable of clearing 50 feet in a 500-foot run. The plane's mission was to act as a liaison agent for the use of ground commanders as well as to locate targets and adjust fire for artillery.[8] These military characteristics were not merely academic, for the new short-range liaison airplane designs were just then being evaluated.

Of 117 bids invited on the circular proposal, 10 were received, and a board of officers selected the designs of Stinson, Bellanca, and Ryan as the winners, in the order named, recommending that three airplanes of each model be obtained. Shortly after the outbreak of war in Europe, the Materiel Division informed the Chief of the Air Corps that three contracts had been negotiated and were awaiting approval:[9]

100 Stinson YC-49	$1,853,451.69
3 Bellanca YC-50	181,693.00
3 Ryan YC-51	132,020.00

8. Board Proceedings on Mil. Characteristics of Obsn. Aircraft, 16 May 1939, in ATSC Central files, Mil. Characteristics, Airplanes and Airships, Corps Obsn., 1939. See also Minutes of Board meetings, 22 May 1939, in AAG 452.1B, Obsn. (C).
9. Contracting Officer, MD to C/AC, 6 May 1939, and 5th ind., MD to C/AC, 8 Sep. 1939, in Case History, "Liaison Aircraft Program" (S).

Contracts approved in September 1939 could not materialize into production in time to meet the demands of the rapidly expanding ground forces. The Field Artillery in particular was insistent upon the need for slow-flying airplanes. Typical of the belated cry for observation-airplane artillery adjustment was an article in the Field Artillery Journal, which declared that there would be no utility in improving the quality and range of field pieces unless Air Corps appropriations included funds earmarked for artillery fire-control airplanes.[10]

The Field Artillery cry was "belated" because in France the ground arms had been pleading for organic artillery-observation aviation over a period of several years. The precedent of World War I in the battles of the Somme and Verdun, "where artillery firing, nearly without exception, was controlled by airplanes," had made a profound impression on French military thinking. While almost no articles appeared on the subject in the United States, the French military and aviation periodicals were full of discussions regarding organic air units in the artillery and the types of equipment best suited to the work. One writer, discussing artillery aviation, summed up the problem concisely in suggesting that artillery units should be equipped with light, unarmed "tourist" airplanes, such as the Fairchild "24," capable of landing near the battery served.[11]

Probably the most influential French author on the subject in the

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10. "Flying Observation Posts for Artillery," in Field Artillery Journal, XXIX (1939), p. 197.
11. "A Propos de l'Aviation d'Artillerie" in Revue de l'Armée de l'Air, Jan.-Feb. 1939, p. 83; "Sur une Aviation d'Artillerie Autonome," in ibid., p. 3; Capt. Paul Aodet, "L'Avion d'Artillerie," in Revue, Nov.-Dec. 1939, p. 627.

United States was Lt. Col. A. Verdurand, a French Army air reservist whose discussion of artillery aviation was translated and reprinted at the Army War College for distribution to the services. Colonel Verdurand reviewed the background of aerial artillery observation, cited the dictum of General Estienne prior to 1914 regarding the need for artillery aviation, and reached the conclusion that artillery aviation should be organic because the air arm would never accord ground cooperation more then a "modest rank in the order of its priorities." The colonel cited the specific military characteristics which artillery observation aircraft should have: slow speed, no armament, landing qualities suited to operating from unprepared and minute fields near the firing batteries, and demountable wings for road transportation. After suggesting the British Comper Scamp as representative of the desired type, Colonel Verdurand noted that such airplanes should be comparable in cost to a standard five-ton truck.[12]

Without attempting to assess the relative importance or degree of influence exercised by the French publication, it is significant to note that Field Artillery opinion immediately began to reflect a similar attitude. The Chief of Field Artillery was reported as "keenly interested in the development of artillery observation airplanes," and distressed that "no substantial progress in this highly important matter has been made since the war."[13]

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12. "Give the Artillery its own Observation Planes," mimeograph-reprint from Revue d'Artillerie, Jan. 1939, reprint from original article in Revue de l'Armée de l'Air, by Lt. Col. A. Verdurand, Air Reserve, French Army. Translation, Army War College, 9 May 1939, Misc., No. 6, 1938-1939, in AAG 452.1B Obsn. (C).
13. Memo for Maj. Hodge, G-3 by Exec., OCFA, 22 May 1939, in AAG 452.1B, Obsn. (C).

However thoroughly the higher echelons of command were convinced of the need for slow-flying airplanes, it is important to remember that the tactical units were not yet using them. A Philadelphia National Guard unit borrowed an autogiro for use in the 1939 maneuvers and commented that "even a slow-flying airplane (if we had one) could not approach the autogiro" in being able to find landing fields.[14] If the Air Corps seemed progressive in developing slow-flying airplanes, it must be remembered that the tactical units could not perfect their use without receiving them in quantities.

The Office of the Chief of Infantry visualized observation missions in cooperation with infantry troops, including five-mile penetration over hostile areas to locate points of organized defense, massed reserves, tank concentrations, and road blocks, as well as to report promptly to front-line battalions all enemy tactical movements.[15] Despite this extensive function anticipated by the Infantry, the observation squadrons which were to serve the corps and division were still equipped for a very different role.

Early in 1938 the corps area commanders had been instructed to conduct service tests of the O-46 and O-47 under field service conditions from small, unimproved fields in order to determine whether the substantial increases in speed, weight, and complexity of corps and division

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14. Capt. L. B. Ely, FA, "The Autogiro--An Observation Post," in Field Artillery Journal, XXIX (1939), p. 202. Discussion of 108th Field Artillery Regiment in Philadelphia National Guard maneuvers.
15. Memo prepared by Office, Chief of Infantry, 22 May 1939, in AAG 452.1B, Obsn. (C).

observation airplanes had not had an adverse effect upon the suitability of the type to perform its assigned mission.[16]

In response to this directive, the commanding officer of the 97th Observation Squadron reported on maneuvers held at Pine Camp and Fort Dix, where an "excellent opportunity" had been afforded to operate from "small unimproved fields." The Pine Camp field consisted of two surfaced runways, 100 by 1,000 and 2,000 feet; the Fort Dix field consisted of a sodded square, 1,200 feet to a side. The report considered these areas "typical of what can be expected in wartime use by observation aviation cooperating with the Corps and Division," and believed that the speeds of the O-46 and O-47 had had "no adverse effect" upon their ability to perform the assigned mission.[17]

Nevertheless, the Materiel Division pointed out that the reports of various boards and studies by the Technical Committee found the O-47 inadequate for corps and division use. OCAC answered: "In view of the proposed Expansion Program of the Air Corps, changes in the Military Characteristics for Corps and Division Observation type airplanes will not be made at this time."[18] Although OCAC would scarcely admit being committed to a policy of obsolescent airplanes, its unwillingness to re-evaluate existing equipment was almost certain to lead to difficulties in a time when large procurements were anticipated. A report from a

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16. TAG to CG, II Corps Area, 15 Jan. 1938, in AISC 452.1, Obsn., Corps and Div., 1939 (C).
17. CO, 97th Obsn. Sq. to C/AC, 24 Oct. 1938, in ibid.
18. Letter cited above: 3d ind., MD to C/AC, 16 Nov. 1938, and 4th ind., OCAC to MD, 29 Nov. 1938, in AAG 452.1A, Obsn. (C).

tactical unit, received somewhat later, pointed up the nature of these difficulties:[19]

> The O-46 is a very nice fair weather cross country airplane for a pilot who is in no great hurry. It is too slow to outrun hostile pursuits and is too heavy to out-maneuver them. It is too heavy to work out of wet, unprepared fields and is too slow on the take-off to get out of fields surrounded by woods, and is too big to hide under the trees.

At almost the very same time this report was written, the Air Corps was purchasing a large number of corps and division airplanes.[20]

Even as late as April 1939, the board evaluating the winners of C. P. 39-2 for utility as to type came to the conclusion that "justification for the introduction of this type of military airplane has not been sufficiently proven to warrant its procurement in quantity at this time."[21] Despite this hesitancy, appropriations had been earmarked to provide for 250 short-range type observation airplanes. The following chart gives a comprehensive picture of anticipated observation airplane procurement during the critical period immediately prior to the war:[22]

	Observation	Corps and Division Liaison
On hand, Dec. 1938	246	-
On order, Dec. 1938	113	-
On hand, Dec. 1939	359	-
On order, Dec. 1939	74	-
Supplementary order, 1939	-	-

19. 1st ind., CO, AC Troops, Fort Lewis, Wash., to C/AC, 21 March 1939, in AAG 452.1B, Obsn. (C).
20. See O-47B contract A-535 ac11994, approved 18 March 1939, in ATSC Contract files.
21. Résumé of Short Range Liaison Airplane Program, unsigned, undated notes in AAG 452.1B, Obsn. (C).
22. Chart of 5,500 Airplane Program prepared by Exec., MD, 10 Feb. 1939, in ATSC Central files, Expansion Program, 1939 (C).

	Observation	Corps and Division Liaison
Regular order, 1940	-	-
5,500 Program, 1940	203	250
On hand, 1940	411	250

The outbreak of war in Europe in September 1939 must have seemed to provide ample justification for pushing the short-range liaison type into production. The O-49 Mockup Board, meeting at Wright Field in September 1939, not only recommended that the government take up its options on the outstanding contract with Stinson but also suggested the utility of considering procurement of stock-model commercial airplanes, in view of the fact that the requirement for a special type such as the O-49 had resulted in an appreciable increase in cost over commercial airplanes with relatively comparable performance.[23]

The figure of 250 airplanes in the 5,500 Program had been determined on the basis of three short-range liaison -type airplanes for 41 existing observation squadrons (12 Regular Army and 29 National Guard), or a total of 123 with a 100 per cent reserve of 127, making a total requirement of 250 airplanes.[24] The 100 O-49's, 3 O-50's, and 3 O-51's already on order totaled 106 airplanes, which left 144 of the authorized number as yet unprovided, but the Air Corps was unwilling to approve additional procurement until extensive service tests could be performed on the new types.

Since the 106 airplanes on order were insufficient to equip existing

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23. Board Proceedings, O-49 Mock-up, 6 Sep. 1939, in AAG 452.1B. Obsn. (C).
24. Memo for record by Brig. Gen. L. D. Gasser, Actg. DC/S, 10 April 1940, Tab. A, incl. with C/MD to C/AC, 22 March 1940, in AAG 452.1B, Liaison (C).

observation squadrons with a minimum number of airplanes, a total need calculated at 123, there was considerable pressure on the Materiel Division to procure substitutes in the form of commercial models.[25]

The Air Corps had been disappointed in the results of C. P. 39-2, which had returned plans for airplanes costing substantially two-thirds of the cost of existing corps and division types. This unexpectedly high cost had obligated a proportionally great amount of the available funds, making it imperative to consider less expensive models in order to procure the desired quantity without recourse to a deficiency appropriation.[26]

Late in November OCAC division chiefs decided to prepare a circular proposal for commercial liaison aircraft to permit a 30-day opening of bids. The objective in mind was to have a sufficient number of airplanes ready for the 1940 spring Army maneuvers. The necessity had become so urgent that the division chiefs agreed to procure commercial models no matter what the utility board findings happened to be.[27]

To implement the policy of reducing the specifications and the requirements in order to make commercial models acceptable, the Air Corps forwarded a revised and amended version of the military characteristics for short-range liaison observation airplanes to The Adjutant General for record and formal approval. The revised form contemplated a mission including "liaison within friendly lines," primarily to assist corps and division commanders in maintaining contact with brigade, regimental,

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25. Chief, Eng. Sec. to Asst. C/MD, 20 Oct. 1939, in ATSC Central files, Mil. Characteristics of Airplanes and Airships, Corps Obsn., 1939.
26. C/AC to TAG, 4 Nov. 1939, in AAG 452.1B, Obsn. (C).
27. TWX, Chief, Eng. Sec. to Tech. Exec., MD, 28 Nov. 1939, in ATSC Central files, Mil. Characteristics, Airplanes, and Airships, Corps Obsn., 1939 (C).

and battalion headquarters. Most significantly, the performance characteristics, as revised, called for landing and take-off on 1,000-foot sod runways. The Air Corps letter made no secret of the real reason for the changes sought:[28]

> In the event an extended service test demonstrates that a strictly commercial type will perform the limited military mission envisioned for this particular type, a savings of approximately $16,000 per airplane can be effected with the added advantage of accelerated production and simplification of procurement in the event of a war.

Furthermore, as the Chief of the Air Corps pointed out, procurement of large numbers of inexpensive, short-range liaison observation airplanes would release the more expensive corps and division observation airplanes from a variety of missions, thereby increasing the number actually available for more extended missions over hostile lines.[29]

When the plan to utilize commercial models was first proposed to the various Army branch chiefs, it was given an "enthusiastic reception," and their primary question had been to inquire the earliest date at which the light, stock-model airplanes would be available in quantity.[30]

As soon as the revised military characteristics for the type were circulated, however, the enthusiasm turned to criticism. The Chief of Field Artillery summarized the service objections to the amended standards. Fire control or artillery adjustment had been omitted from the stated mission; the landing and take-off runway distance was objectionably long; and finally, while commercial models were acceptable for test, the Field

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28. Asst. C/AC to TAG, 29 Nov. 1939, in ibid.
29. C/AC to AS/W, 29 Nov. 1939, in AAG 452.1B, Obsn. (C).
30. Tech. Exec., MD (Wash.) to MD (WF), 30 Nov. 1939, in ibid.

Artillery was emphatic in pointing out that they were not acceptable as substitutes for the O-49 which had been designed to do a special job and could be expected to do it well.[31]

The objections of the using arms led the Air Corps to rephrase the statement of mission to conform with that prepared for C. P. 39-2, which had produced the O-49. The performance characteristic for landing and take-off was redrafted to conform to O-49 performance as "desired" and to the performance of the best of the commercial models, the Stinson C-105, as the "minimum" acceptable.[32]

In March 1940, a board of officers appointed to evaluate the bids submitted in response to C. P. 40-550, calling for a 30-day opening, found that all of the airplanes submitted in the competition were of such limited utility that they did not justify procurement. The board recommended that all bids be rejected and other steps be taken to fulfill the requirement.[33]

The original requirement for light planes in the 5,500 Program called for 250 airplanes, of which 123 were allocated to squadrons and 127 were reserve. Since 106 had already been procured, only 17 remained to complete the minimum requirement. This number, plus a 15 per cent operating reserve of 18, made a total of 35 airplanes which had to be procured to meet immediate obligations to tactical units. Sufficient funds remained in the 1940 allocation to procure about 35 O-49 airplanes which would

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31. AC Technical Com. to Field Artillery, Infantry, and Cavalry, 4 Dec. 1939, and 1st ind., OCFA to C/AC, 5 Dec. 1939, in ibid.
32. C/AC to TAG, 29 Nov. 1939, and 1st ind., TAG to C/AC 4 Dec. 1939, in ATSC Central files, Mil. Characteristics of Airplanes and Airships, Corps Obsn., 1939 (C); Minutes of AC Technical Com. Meeting, 7 Dec. 1939, in ATSC 334.8, AC Tech. Com., 1940.
33. C/AD to C/AC, 22 March 1940, in AAG 452.1B, Liaison (C).

meet the minimum requirement until 1941.[34] This number fell short of the 250 allocated on the 5,500 Program, and the 5,500 Program was to be only the first of an ever-expanding series of programs each more ambitious than its forerunner.

The war in Europe and the Army maneuvers of 1940 were to influence the course of short-range liaison observation airplanes far beyond expectations as tactical experience enlarged the scope of the liaison mission outside the sphere originally conceived for it in military circles.

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34. See n. 24. See also Asst. C/AC, Report on Conference at OCAC with using services regarding liaison airplanes, 10 April 1940, in AAG 452.1, Obsn.

Chapter VII

LESSONS LEARNED FROM THE EUROPEAN WAR AND FROM MANEUVERS, 1940-1941

Early in 1940 the Air Corps Tactical School circulated a questionnaire among the existing observation squadrons for opinions regarding proposed organizational changes growing from the trend toward mechanization, the formation of the new infantry division, and the development of new observation equipment. The questionnaire was significant not so much for the details it contained as for the attitude it represented.[1] The Tactical School appreciated the changes of the times which impelled reconsideration of tactical doctrine, and directly or indirectly the school's interest proved important, since shortly thereafter the long-standing basic regulation governing the use of observation aviation, TR 440-15 of October 1935, was superseded by FM 1-5, Employment of Aviation of the Army.

The new field manual considered observation aviation in two classes, reconnaissance on the one hand and observation and liaison on the other. The really radical change over previous doctrine appeared in the definition that observation and liaison aviation were "characterized by the ability to fly at very low speeds and to take off and land within small level areas."[2] It was apparent from this definition that official thinking was beginning to outstrip existing equipment, for at that time the O-47 and its predecessors were still the standard equipment of observation squadrons.

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1. AC Tactical School Questionnaire, "Tactics and Techniques of Observation Aviation on Infantry and Cavalry Missions," in AAG 452.1I, Obsn.
2. FM 1-5, Employment of Aviation of the Army, 5 April 1940.

The growth of the tactical concept of slow-flying airplanes was perhaps far slower in the tactical units, which were still using obsolete equipment, than in the higher echelons of command, where European reports, information concerning anticipated O-49 procurement, and other similar theoretical considerations had been discussed in detail. In reply to a request from OCAC, Plans Division compiled a list of functions for short-range liaison airplanes to supplement but not supplant the functions assigned to corps and division airplanes.

Plans Division envisioned the short-range liaison airplane for use in friendly territory, where security from hostile action would not be solely dependent upon speed of flight and the defensive fire power of the airplane's own weapons. The new aircraft type was considered suitable for general use as a courier and messenger agent, a convenient transport for unit commanders and staff officers, a command observation airplane suited to use in reconnoitering routes, camp sites, and airdrome locations, as well as a plane to check camouflage and perform conventional infantry and artillery missions of liaison and fire control.[3]

Gradually, the Air Corps and the ground forces were reaching an understanding in the matter of corps and division observation airplanes. As the ground arms drew a clearer picture of the tactical function expected of the air arm, it became increasingly easier for the Air Corps to develop the specialized equipment necessary for the liaison role. The importance of fostering coordination between air and ground elements was pointedly expressed by a San Antonio Air Depot engineering officer,

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3. R&R, Plans Div. to Exec., OCAC, 4 Jan. 1940, in Plans Div. files, 452.1, Obsn. Aircraft, AFSHO.

who considered the O-47 a "very poor job" but confessed to a Materiel Division representative in proposing a slow-flying, short-range observation airplane: "I never realized the need for such an airplane until I took the course at Fort Leavenworth some years ago."[4] But maneuvers, tactical schools, and command courses, for all their value, could never equal the contribution of actual warfare in the perfection of tactical concepts.

In April 1940 the Military Attaché for Air in Paris, Lt. Col. G. C. Kenney, reported that developments in the European war indicated the urgent necessity of re-examining the existing observation squadron organization and the military characteristics of the equipment used. Unwilling to repeat the failure to accept last-minute reappraisals made at the time of the Expansion Program estimates, OCAC now pointed out that it was exceptionally important to reconsider the problem since the hour had arrived to prepare for the 1942 budget. The Air Corps recommended that a board of representatives from the using arms consider the question at once, but the General Staff saw no need for such a board because the Air Corps Technical Committee was already required by Army Regulations to include using-arm representatives when dealing with questions on cooperation equipment. But whatever the organization of the board or committee, the impact of the reality of war upon military thinking in the United States was unmistakable.[5]

Reports from abroad continued to reiterate the importance of slow-flying observation airplanes. The Attaché in London quoted the British

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4. Maj. Clements McMullen to Lt. Col. F. O. Carroll, 24 Oct. 1940, in ATSC 452.1, Div. Airplane, 1940.
5. C/AC to TAG, 19 April 1940, and 1st ind., AGO to C/AC, 23 April 1940, in AAG 452.1B, Obsn. (C). See also, AR 850-25.

War Office as "thoroughly sold on the idea of adopting a light, small, two-place, high wing monoplane for use in close Division observation." Further reports revealed that British artillery was emphatic in demanding an observation fire-control airplane, since experience in France and the Low Countries had convinced the army that "dependence upon the RAF, who appear to consider all forms of Army-cooperation a side issue, is futile." The War Office purchased 200 light Stinsons for artillery and infantry liaison as well as staff-communications missions, and attaché reports revealed that the French air arm was "vitally interested" in a similar development which had been tested in France with success.

The test of combat experience seemed to prove the value of unarmed, slow-flying airplanes, but a fair combat test was difficult, if not impossible, as indicated by the fact that it was War Office funds and not Air Ministry funds which purchased the 200 Stinsons. The contest of organic versus integral air-arm observation units was not an isolated problem peculiar to the United States.[6]

In many respects the Air Corps seemed far more willing than the RAF to cooperate with the ground forces. Unfortunately, the delay in procuring light airplanes in quantity led the ground forces to overemphasize the Air Corps' unwillingness to cooperate and consequently to stress the necessity of organic observation aviation within the ground arms.

The Field Artillery, in particular, was determined to secure its own air observation posts. Accepting Marshal Foch's dictum that "there

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6. Mil. Attaché, London, Repts. 41065, 4 April 1940; 41092, 24 April 1940; 41104, 26 April 1940; and 41872, 20 Nov. 1940, in WF Tech. Data Lib., Great Britain, C21/43, C71.2/32, C71.2/33, and C71.2/35.

is no combat without artillery and no artillery without aviation," the Field Artillery quoted reports from the Military Attaché in Germany, where slow-flying airplanes were being used as an "integral part of the combat team" and as "extra eyes for the army, quite apart from the general air arm." Just why the Field Artillery had not heeded Marshal Foch's advice 20 years earlier is hard to understand, but whatever the explanation, the fact remained that in July 1940 the Office of the Chief of Field Artillery recommended that a flight of seven light airplanes be assigned to each artillery brigade of the square division.

The Field Artillery proposal for organic observation aviation reflected the failure of the Air Corps to supply the airplanes at the time they were needed and of the kind that were needed. The two characteristics established by the Artillery were (1) airplanes that could land and take off from small unprepared fields, and (2) the immediate availability of such airplanes.[7]

The General Staff did not favor an organic observation aviation element for the Field Artillery on the grounds that to do so would soon lead to a half-dozen separate air elements for all the other arms and services. However, while granting that the existing observation-squadron organization was "admittedly a compromise," a General Staff spokesman pointed out that there were a number of factors which had prevented observation aviation from developing into an adequate tactical weapon. The lack of maneuvers involving large numbers of troops had hindered the evolution of tactical techniques, while the assignment of observation

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7. OCFA to TAG, 15 July 1940, in OCAC, Plans Div. files, 360.02 Studies on Aviation; MID Report 24042-M, 15 Feb. 1938, quoted from Le Temps, 5 Feb. 1938. In AF Tech. Data Lib., C71.2/30.

squadrons to service schools had led to a dangerous overspecialization, such as the development of tow-target work, not related to the primary tactical function.

An Air Corps observation board had previously raised these points in emphasizing the fact that "administrative flying," in which observation airplanes were used as air base work-horse or utility carriers, had impaired the growth of observation training. Moreover, the board pointed out that until comparatively recently observation squadrons had spent the entire year operating from permanent, home bases with never an opportunity to experience actual field conditions. The board had even gone so far as to suggest that control and responsibility for training observation units might well be vested in the tactical units with which the observation units served rather than in the corps area commanders as current practice had established. This recommendation suggests a definite willingness on the part of the Air Corps to experiment for the best possible solution. The General Staff continued to support the Air Corps' principle of integrity in frowning on organic observation in the Field Artillery.[8]

Meanwhile battle experience was influencing Air Corps thinking. When a representative board of Air Corps officers was willing to admit that the O-47 was not satisfactory since the situation in Europe had changed observation tactics and "necessitated radical changes in

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8. Memo for C/S by Actg. AC/S, [G-?], 25 Nov. 1940, in OCAC Plans Div. files, 360.02, Studies on Aviation. See also, TI 257, MD (Wash.) to Tech. Exec., MD (WF), 15 July 1940, and Board Proceedings on corrective action for difficulties encountered by observation squadrons under field conditions, 5 July 1940, in ATSC 320.2, Organization of Obsn. Sqs., 1941.

observation equipment,"the Air Corps was merely reflecting the progress of actual combat conditions of which there had been no successful simulation in the United States for 20 years or more.[9] The response to European reports is nowhere better expressed than in the plans drawn up to overcome the immobility of the existing observation squadron organizations in cooperative action with mechanized forces.

If the Field Artillery demanded organic observation aviation, the Air Corps appeared determined to take every possible step to prevent a similar cry from cropping up among the mechanized divisions which were expected to grow out of Brig. Gen. A. R. Chaffee's mechanized brigade. A board of Air Corps officers prepared a revised table of organization for an observation squadron to cooperate with mechanized forces, and the equipment planned for the squadron included two types of aircraft: fast, armed, high-performance, twin-engine airplanes and slow-flying, unarmed, light airplanes for courier-liaison work "well behind friendly lines."[10]

Despite the fact that the services had been unable to practice with slow-flying airplanes, everywhere the principles of their use were coming to be accepted. The General Staff was reported as being "very much interested" in the problem of light airplanes, and the Chief of the Air Corps had approved a plan to service-test one of each of the three commercial-model airplanes already under procurement at the Fort Benning Infantry School, the Fort Riley Cavalry School, and the Fort Sill

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9. Ibid.
10. Board Proceedings, organization of observation unit to perform with mechanized division, 24 June 1940, in ATSC 320.2, Board Report on Proposed Obsn. Unit, 1940.

Artillery School.[11] Unfortunately, as late as August 1940 the Stinson YC-49 and the Bellanca YC-50 had not yet been completed.[12]

The Materiel Division's Engineering Section directed the Production Engineering Section to prepare a detailed service-test questionnaire on the technical aspects of the new type, but left the tactical and utility considerations to the using arms. This procedure may have been entirely logical, but the failure to perfect an elaborately detailed tactical questionnaire similar to the technical questionnaire prepared by the Materiel Division had a serious effect upon procurement. Since tactical function was of the utmost importance in basic design, it was dangerous to persist in employing subjective tactical utility reports, or reports of decidedly less objectivity than was customary in Materiel Division technical reports, in the procedure leading toward the development of a new type.[13]

The acceptance of slow-flying airplanes is perhaps the more remarkable in view of the fact that the demand for the type in quantity preceded the allocation of the initial service-test items. This was, in a measure, the result of European experience, especially that with the German Storch, and partly the result of the shortcomings in existing equipment, such as the O-47, when given adequate tactical tests.

The First Army maneuvers in Plattsburg in the summer of 1939 demonstrated the "urgent necessity" for an airplane capable of performing liaison missions. The small number of autogiros available was merely

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11. R&R, Plans Div. to MD, 26 March 1940, in OCAC Plans Div. files, 452.1, Obsn. Aircraft.
12. C/MD to C/AC, 23 Aug. 1940, in AAG 452.1B, Obsn. (C).
13. T.X, Eng. Sec. (Wash.) to Prod. Eng. Sec. (WF), 18 March 1940, in ATSC 452.1, Airplane, Obsn., Short Range Liaison, 1942.

sufficient to demonstrate what could be expected of more conventional aircraft with similar characteristics, but the vicious circle was hard to escape. Since there had been no large-scale maneuvers, it had been difficult to establish a requirement for slow-flying airplanes. With no well-established requirement to justify the expense, it had been difficult for the Materiel Division to develop a unique type of airplane, and now, belatedly, the using arms were demanding a light airplane which the Air Corps had ordered but could not produce in quantity in the short time remaining before the fall maneuvers of 1940.[14]

Admittedly, the 1940 fall maneuvers of the four armies in no case lasted more than five days, but even that limited opportunity for tactical experience in conjunction with a large body of troops promised to be invaluable if it could be exploited. So far as the Air Corps procurement program was concerned, there seemed to be little promise of successful exploitation.[15] But war experience in Europe was to force a decision in observation aviation regardless of the limited scope of the maneuvers of 1940.

The lessons of combat seemed to demonstrate that the Air Corps had spent 20-odd years backing the wrong airplane. Maj. Gen. D. C. Emmons, reporting first-hand evidence from the scene of action declared in October 1940: "Observation aviation as a type must be scrapped. It cannot function under modern battle conditions. In its place must be a fast, well armed, light bomber." This report was further amplified by

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14. Hq., 2d Corps Area to TAG, 21 March 1940, in M&S, MD, Aircraft Projects Br. files, Liaison, 1940-1941.
15. ICM, Chief, Field Service Sec., MD (Wash.) to FSS, MD (WF), 26 July 1940, in ATSC 361, Fall Army Maneuvers, General, 1942.

General Emmons on his return from London: "We had the opportunity of talking with several commanders who had served in France prior to the evacuation from Dunkirk; they are definitely of the opinion that the day of the Corps and Division type, as we know it, has gone forever."

In their haste to abandon the corps and division observation airplane, the British were inclined to discount the value of the light, unarmed, slow-flying airplane, but the Air Corps, while admitting the vulnerability of the type to hostile attack, continued to back the light airplane because of its utility in areas where air superiority made its use possible. The Field Artillery took the occasion to reiterate the need for short-run landing characteristics as an asset in escaping destruction, so that the airplane could land immediately in almost any terrain when threatened by hostile air attacks.[16]

The trend became a policy in October 1940, when the Air Corps Technical Committee made a comprehensive study of observation aviation, with representatives of the Air Corps, GHQ Air Force, Infantry, Field Artillery, Cavalry, Coast Artillery, and Signal Corps all present to evaluate the experience of the several arms and services in the light of the reports from Europe. The committee's conclusions were another step in the evolution of the observation concept--in defining the term even more narrowly than before. Observation, the committee decided, would be performed by two types of aircraft: (1) the unarmed, short-range liaison airplane, and (2) the twin-engine, long-range, fully

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16. Memo for C/AC by Chief Plans Div., 9 Oct. 1940, in AAG 452.1B, Obsn. (S).

armed airplane for strategic and tactical reconnaissance. The latter possessed military characteristics comparable to those of the light bomber type.[17]

The short-range liaison observation airplane was no longer a service-test stepchild but an equal partner with the twin-engine type. The Technical Committee's decision did not work an immediate change throughout the service. Official doctrine continued to develop slowly behind the advance of the changing concept.

When a new Air Corps Field Manual, FM 1-20, Tactics and Technique of Air Reconnaissance and Observation, appeared in February 1941, it seemed almost that the Technical Committee's decision had been in vain. The new field manual, which continued to discuss corps and division observation airplanes as "light, moderate speed equipment," asserted that the "most important employment of the balloon" was in artillery observation, and insisted that every staff officer should be a "qualified aerial gunner that he may man the gun of the station he occupies." The latter was a direct reference to the old corps and division observation airplane.[18]

In the tactical units, however, there was a growing uneasiness about the problem of observation squadrons. An Air Corps officer reported to the commanding general of the IX Army Corps after an inspection trip: "The entire concept of observation aviation . . . needs to be . . . remodeled." After an absence of 10 years, he found "practically no change in the basic theories of the branch and very little change in the

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17. OCAC to TAG, 11 Oct. 1940, in AG 452.1, Mil. Characteristics, Obsn., 1941.
18. FM 1-20, Tactics and Technique of Air Reconnaissance and Observation, 10 Feb. 1941.

equipment assigned." It appeared that an important branch of the Air Corps had "stagnated for the past fifteen years" and "should be the subject of immediate study."[19] General Emmons, speaking in an Air Council meeting, was less conservative; he felt that observation aviation had not progressed in 20 years.

The consensus of the Air Council, including Generals Arnold, Brett, and Emmons, Col. M. S. Fairchild, and Assistant Secretary of War for Air Robert A. Lovett, was that observation aviation had fallen into a state of neglect because observation squadrons were isolated from the Air Corps, and corps area commanders certainly could not accept them as a primary responsibility. In short, the observation squadrons had had no one to "go to bat for them."[20]

Whatever the cause of the neglected status of observation aviation, by the spring of 1941 even the lower echelons were beginning to realize the inadequacy of the existing organizations. One critic, labeling his remarks the "crystalization of the composite views of many air and ground officers," probably represented an awareness of observation's shortcomings that was becoming general when he wrote:[21]

> A senior military observer in discussing the German blitzkrieg in France gave as one of the many reasons advanced for the poor performance of the French military forces, the entire lack of aircraft observation for those forces. The French observation was perhaps on a par, plane for plane, with that existing in our army today, and the French observation service was trained along the same lines. If faced with similar conditions, our observation service would be just as helpless, if not more so than the French.

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19. CO, AC Troops, Fort Lewis, Wash. to CG, 9th Army Corps, 25 Feb. 1941, in OCAC Plans Div. files, 320.4, Cooperation Air Command.
20. Minutes of 1st Air Council Meeting, 2 July 1941, in AAG 337, bulk files (C).
21. CO, AC Troops, Fort Lewis, Wash. to CG, 9th Army Corps, 17 March 1941, in OCAC Plans Div. files, 320.4, Cooperation Air Command.

The questioning and critical attitude represented by this statement was probably a healthy one. The evolution of tactical ideas was even less certain than the evolution of technical ideas, for the process of evaluating available information was of necessity infinitely less scientific. Opinion continued to serve in lieu of battle experience. Even where battle experience was available, the process of extracting accurate tactical conclusions reached different ends when different organizations studied the same events.

If tactical doctrine evolved slowly in the United States, the same could be said of Great Britain. Air Ministry officials believed that slow-flying, unarmed aircraft would find it difficult to survive under modern battle conditions. The airman's point of view seemed to persist in distorting the pattern of ground operations: "If you have such a high degree of air superiority that light aircraft can function, then the situation on the ground will not be static; your guns will be constantly on the move, and the demands for air observation will be slight." Although combat experience in the following three years was to prove this view erroneous, the opinion is worth considering because it helps to explain why the Field Artillery demanded organic observation aviation. When an RAF officer, supposedly representing Air Ministry opinion, said of the short-range liaison airplane, "our view on this is, 'let the soldiers play with their toys, it amuses them and doesn't do us any harm,'" it is not difficult to understand why there should be differences of opinion regarding tactical doctrine.[22]

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22. Copy of memo by Dir. of Plans, RAF, Jan. 1941, in AAG 452.1C, Obsn. (C).

The RAF may have scorned light airplanes; British ground forces did not. Observers representing the U.S. Army Field Artillery at British maneuvers in 1941 reported that Stinson and Taylor cubs flown by artillery officers "gave excellent service when used, but unfortunately were forgotten by . . . commanders after the first day or two."

As in the United States, British experience seemed to demonstrate that there was no substitute for combat in completely "selling" the liaison airplane idea to commanders. Nevertheless, the observers at the British maneuvers drew some important lessons from the British exercises. They were convinced that the "air observation post" was of great value and should be encouraged in the United States; they recognized the necessity of drilling into ground commanders a thorough understanding of the uses of slow-flying airplanes, especially emphasizing the fact that it was very dangerous to misuse an unarmed aircraft. Commanders had to be educated to realize that the slow-flying airplanes could not fly on hostile area missions for which they were not designed.[23]

German commanders were more fortunate. Their "maneuvers" in the invasion of Poland and later in France presented ample opportunity to perfect the use of Storch liaison airplanes in conjunction with ground forces. The Field Artillery Journal reprinted a startling photograph illustrating the Storch at work adjusting artillery fire on a column of French tanks while flying scarcely 200 feet overhead. Artilleristische Rundschau reported in detail on the extensive use of liaison airplanes by the German Army.[24]

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23. Mil. Attaché, London, Repts., 10 Nov. and 15 Dec. 1941, in AF Tech. Data Lib., C71.4/12 and C71.4/11.
24. Pvt. John Colbarst, "Light Planes are War Planes," in Infantry Journal, XLVIII-XLIX (July 1941), p. 43; "Aerial Observation," in Field Artillery Journal, XXXI (1941), p. 355.

Despite all this publicity, word of the new short-range liaison airplane seemed to circulate slowly in the United States. The commanding general of the Fourth Army wrote General Marshall: "I have been informed that the Regular Army squadrons are to get O-49 and O-52 types this fall. . . . Neither is a modern type and both types have been abandoned by the British and the Germans."[25] If the general did not know that the O-49 was far from obsolete, he could scarcely be blamed, for the Air Corps had been slow in making good the initial deliveries of the new type.

Early in 1941 the Field Artillery, disgruntled at the slow delivery of the O-49 airplanes, again raised the issue of commercial models to serve as "a suitable stop-gap until the liaison type airplane becomes available in quantity."[26] An artillery officer writing in the Field Artillery Journal put the question squarely: "Why not use the resources we have?"[27] Admittedly, the Air Corps' O-49 had superior qualities, but where was it?

In June 1941 the Secretary of War informed General Arnold of ground force plans to use 12 Piper Cubs during the Second Army's June maneuvers in Tennessee. The Piper Aircraft Company made the original arrangements with the Second Army, but, believing it wise for the three largest light-airplane manufacturers in the United States to be represented, invited Aeronca and Taylor to participate in the tests. The commercial airplanes employed in this exercise were only rented from the manufacturers and they were flown by civilian pilots who were manufacturers' representatives.

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25. CG, 4th Army to Gen. G. C. Marshall, 5 Aug. 1941, in OCAC Plans Div. files, 452.1, Obsn. Aircraft.
26. Memo prepared for the C/S, 16 Jan. 1941, in G-4 files, AC 27277-91, in AGO WD Rec. Br.
27. Maj. W. W. Ford, FA, "Wings for Santa Barbara," in Field Artillery Journal, XXXI (1941), p. 232.

Apparently the ground forces were enthusiastic, for a similar arrangement was repeated in subsequent maneuvers with the Third Army in July and August, first in Texas and then in Louisiana. When General Arnold learned that airplanes, appropriately called "puddle jumpers" by ground force officers unencumbered with Air Corps terminology, were being procured directly from the manufacturers, he was gravely concerned. The Air Corps was "on the spot" since there were certainly not enough airplanes and pilots to fill the ground force needs. As a Materiel Division officer expressed it: "You can't blame them for resorting to any measures possible to carry out their required training."

While the Air Corps disapproved the idea of makeshifts in hiring commercial airplanes, there were obviously "very few justifiable arguments against it." The Materiel Division, however, felt that service tests should be run by service pilots and not by civilian pilots and mechanics, if any accurate indication of utility and maintenance factors were to be obtained. As if oblivious of the entire question of organic observation aviation for the ground forces, the Materiel Division noted: "There is also some agitation for various ground arms to fly their own airplanes." But if the division really was naive in describing ground force intentions so mildly, there was no lack of realization that service-test reports were absolutely essential. The Engineering Section asked who would submit reports if civilians flew the airplanes, and pointed out that if reports had been prepared on the earlier maneuvers, there was need for them at Wright Field.[28]

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28. Case History, "Liaison Airplane Program" (3). See also T.X, EES, (.F) to Exp. Eng. Br. (Wash.), 30 Oct. and 31 Oct. 1941, in AT3C 361, Maneuvers, Ground Arms, South Carolina, Use of Puddle Jumpers, 1941; T.X, Exp. Eng. Br. to EES, 31 Oct. 1941, in AT3C 400.112, Puddle Jumper Aircraft, 1941.

General Arnold perceived the danger of lost effort in the civilian enterprise and ordered a 24-hour shift or any other necessary expedient to rush O-49 production at Stinson to the point where it would be possible to equip at least two full squadrons of O-49's for use in the maneuvers in order to establish an adequate basis of comparison with commercial models.

The results of the manufacturer's trials may have been inadequate from the Materiel Division's point of view, but they were sufficient to induce Assistant Secretary of War for Air Lovett to direct General Arnold to procure a service-test quantity of light airplanes from Piper, Aeronca, and Taylor for assignment with the Air Force Combat Command. If the commercial models with their known limitations should prove acceptable, production and procurement of light airplanes would be vastly facilitated, since "off-the-shelf" commercial types required only 300 man-hours to manufacture, in contrast to the 6,000 man-hours for the O-49.[29]

In order to secure an over-all picture of the rapidly changing observation-squadron problem, the General Staff circulated a questionnaire to the commanding generals of all armies, corps, and divisions asking information on the experience gained during the maneuver period. The questionnaire sought to determine whether or not observation aviation was always available for artillery action when needed; the number of liaison missions flown; and the time lag between requests for observation aviation and the appearance of airplanes in the area. By these and similar questions, the General Staff hoped to determine the most advisable organization for slow-flying aircraft.[30]

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29. Case History, "Liaison Airplane Program" (S).
30. TAG to CG's, all Armies, Corps, Divs., 3 July 1941, in Pentagon Lib., AAF Document file, D60.25.

It is impossible to determine exactly how effective the General Staff questionnaire really was, but in any event the questions asked were probing an important problem, and answers can be found scattered throughout the reports on the maneuvers. General Arnold warned the Chief of Staff that puddle jumpers and O-49's might serve a useful purpose in peacetime maneuvers, but doubted that they would live very long in actual combat. He feared that the use of light airplanes in maneuvers was likely to create "some wrong impression" of what could be expected in war.[31]

General Arnold's distrust of the light airplane and fears for the vulnerability of the unarmed type apparently arose from a certain confusion of functions, the same confusion which the observers at British maneuvers warned against. The commanding general of the Air Force Combat Command clarified the issue by describing the difficulty encountered during the Carolina maneuvers, when puddle jumpers on tactical missions beyond the front lines were ruled casualties by the umpires. This experience led him to believe that the trouble lay in the misuse of the term observation or the designation "O" for puddle jumpers functioning as liaison aircraft. The Combat Command suggested the designation "L" for liaison to overcome this tactical difficulty.[32]

This change in nomenclature seemed to settle the issue for the moment, and the services appeared willing to accept the fact that liaison

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31. Memo for C/S by DC/S for Air, 8 Oct. 1941, in ATSC 361, Fall Army Maneuvers, General, 1942.
32. Rept. by CG, AFCC, 10 Dec. 1941, in ATSC 452.1, Liaison Type Aircraft, Policy, 1944. See also TWX, Prod. Eng. Br. (Wash.) to Prod. Eng. Sec., 5 Jan. 1941, in M&S, MD, Aircraft Projects Br. files, Liaison, 1940-1941.

aircraft would function within the periphery of friendly fire. As an artilleryman pointed out in the Field Artillery Journal, European experience indicated it to be suicidal to fly below 5,000 feet over hostile areas, and, as a corollary, "that within these altitudes and over our own lines, friendly observation aircraft would be comparatively safe."[33]

It remained for a Fort Riley Cavalry officer to express most concisely the prevailing attitude regarding liaison airplanes. They would be very valuable in air areas beyond reach of enemy pursuit, he said. In air areas which could be reached by enemy pursuit, the value of liaison airplanes would be proportional to the degree of air superiority that our forces were able to maintain. Liaison airplanes should not be used for flights over territory occupied by enemy ground forces. Observation and reconnaissance airplanes should be used for such missions.[34]

This visualization of the liaison function marked an important landmark in the concept of the use of light airplanes. Hitherto, the question of vulnerability had been discussed in positive terms--complete dismissal on the grounds of vulnerability to hostile air action or, at the opposite extreme, a blanket assertion of the need for absolute air supremacy to permit any liaison action. Combat experience was to prove that the Cavalry officer's opinion was substantially correct. The use of liaison airplanes lay somewhere between complete air supremacy and utter

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33. Lt. Col. J. B. Mogan, FA, "Air Observation of Artillery Fire," in Field Artillery Journal, XXXI (1941), p. 115.
34. Instructor in Cavalry School to President, Cavalry Board, Fort Riley, 17 Sep. 1941, in ATSC 452.1, Stinson Model "76," 1941.

vulnerability. Experience was also to prove that the Cavalry officer's final dictum on the use of liaison airplanes was not entirely correct, especially when a fluid war of maneuver made the definition of enemy "lines" something unstable.

The maneuvers of 1941 completely sold the light airplane to the ground forces. The Field Artillery, down to the lowest echelon, was enthusiastic. A Mechanized Cavalry officer, speaking for that arm, asserted that the activities of the puddle jumpers with the mechanized regiment produced a "realization among officers and men that such a type of plane is invaluable to ground forces."[35] The Armored Force was even more specific. Experience of the maneuvers led to the conclusion that the Armored Force would require 15 liaison airplanes for each armored division and six for each armored corps headquarters.

A proposed table of organization forwarded to the Materiel Division to facilitate procurement planning established a tentative requirement for 689 liaison airplanes, including spares:[36]

Proposed TO For Liaison Aircraft

Army Observation Group		12 in medium observation squadrons
		48 in four armies at 12 each
		12 20% spares
	Total	72
Armored Corps		6 in medium observation squadrons
		12 in two corps
		4 spares
	Total	22

35. ICF, Asst. Exec., MD (Wash.) to Asst. C/MD (AF), 16 Sep. 1941, inclosing unsigned, undated memo on 104th Cavalry (M. Mechanized) maneuvers at Indiantown Gap, Pa., in ATSC 452.1, Liaison Type Aircraft, Policy, 1944.
36. Col. E. D. Harmon, C/S, Hq. Armored Force, Fort Knox to C/MD (Wash.), 20 Dec. 1941, in ATSC 422.1, Airplane, Obsn., Short Range Liaison, 1940 (C).

Corps Observation Group	6	in medium observation squadrons
	36	in three light observation squadrons
	378	in nine army corps
	99	spares
Total	519	
Cavalry Division	6	in medium observation squadrons
	13	in two divisions
	4	spares
Total	22	
Armored Division	6	in medium observation squadrons
	36	in six divisions
	12	spares
Total	54	
Grand Total	689	

The maneuvers were significant because they introduced the liaison airplane to the ground forces, but even more important because of their far-reaching influence on policy. General McNair, Commanding General of the Army Ground Forces, declared that the fall maneuvers, "our first wobbly efforts," had three definite results so far as air-ground relationships were concerned. First, they paved the way for a new Field Manual, FM 31-35, Aviation Support of Ground Forces, appearing in April 1942, as a revised expression of air-ground doctrine. Second, the maneuvers led to the decision to make artillery observation aviation an organic part of the Field Artillery. And third, the maneuvers induced General McNair to make air-ground cooperation the main item of the 1942 ground force training program.[37]

37. Lt. Col. Kent R. Greenfield, "Air-Ground Cooperation," AGF Historical Study No. 15, in Army War College Lib. This study contains a full discussion of the whole "organic" problem.

There could be no further misunderstanding. The Army Ground Forces had adopted the light airplane completely. The AAF faced the obligation of procuring the new-type airplane in sufficient quantity to meet increased demands and of sufficient quality to stand up to the tactical functions forced upon it. Three years or more in active combat were to prove exacting by requiring the light airplane to perform feats undreamed of in the early stages of its use.

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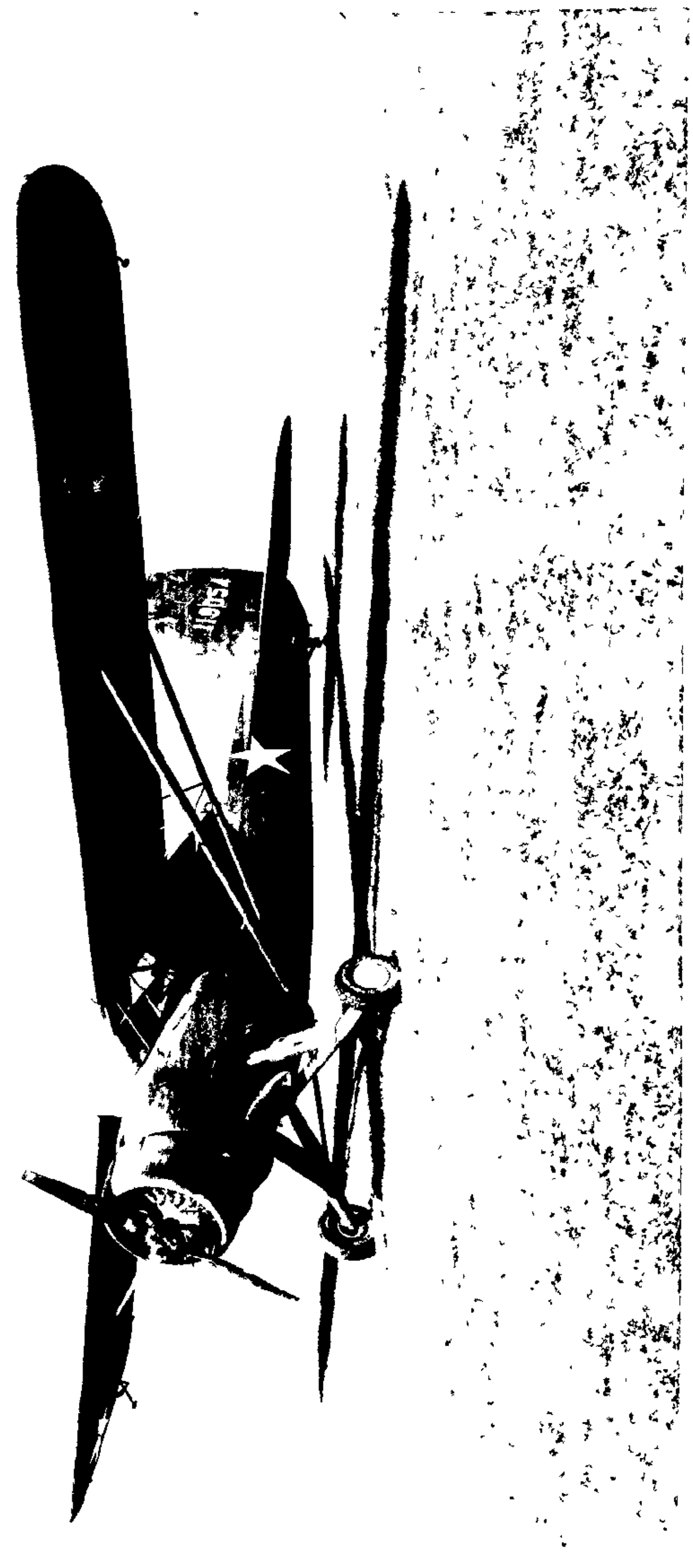

Chapter VIII

THE LIAISON TYPE IS RECOGNIZED, 1942-1944

At a puddle-jumper conference in Washington in January 1942, the ground forces established specific requirements for light airplanes. The Field Artillery anticipated a need for 2,750 airplanes. The Infantry repeated an earlier requirement, one squadron of 13 airplanes for every division. Cavalry and Coast Artillery (antiaircraft brigades) requirements brought the total to approximately 4,000 airplanes, a quantity which demonstrated conclusively how thoroughly the ground forces had accepted the light airplane as a tactical instrument.

Acceptance of the puddle jumper did not, however, change the prevailing ground force attitude with reference to the Air Corps. An observer at the conference noted that "the ground officers present were unanimous in their opinion that the Air Corps has throughout the years failed to provide adequate observation aviation for the ground forces."[1] But circumstances surrounding the procurement of light airplanes in quantity were to prove that the Air Corps was not alone at fault.

Back in August 1941, when the Assistant Secretary of War for Air had directed procurement of a dozen service-test, stock-model airplanes "off-the-shelf" from the three largest light airplane manufacturers, Taylor, Aeronca, and Piper, the Air Corps designated the three makes as YO-57, YO-58, and YO-59. These airplanes, in addition to some others

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1. Case History, "Liaison Airplane Program." This history was the source for the first three pages of this chapter.

provided independently by the Interstate, Rearwin, and Stinson Companies, were not entirely satisfactory. The Combat Command reported that they were in some respects "definitely inferior" to the O-49. But the pressing demand for light airplanes could not wait on O-49 production, which had been disturbingly slow.

In November 1941, after the maneuver tests had been completed, the General Staff suggested that despite the superiority of the O-49, the commercial models had sufficient merit, particularly with regard to cost, to make them a suitable substitute. Moreover, commercial-model production promised to offer the least detriment to the program for production of heavier, armed warplanes. Acting on this advice, the Materiel Division began negotiations to procure 617 light airplanes: 342 airplanes divided among the YO-57, YO-58, and YO-59's, and 275 Stinson "76" airplanes, a vastly improved model which Stinson had hurried to completion during the fall maneuvers.

When the Washington puddle jumper conference established an over-all requirement for 4,000 light airplanes, the Chief of the AAF directed the Materiel Division to increase the existing procurement by 1,000 airplanes. Six months later this number was increased by 1,960 airplanes, entirely for allocation to the Field Artillery.

The light airplane had become a mass-production article. In April 1942 the Secretary of War ordered the designation Observation changed to Liaison. The O-49 became the L-1 and the O-57, O-58, and O-59 became the L-2, L-3, and L-4, respectively. But the liaison aircraft did not really come of age until October, when the Director of Military Requirements issued a statement of liaison aircraft military characteristics which effectively established the type as a class of its own.

The appearance of liaison aircraft as a distinct type, however, did not solve the problems which were inherent in the peculiar position of a weapon procured by the Army Air Forces for use with the Army Ground Forces. One of the most serious difficulties of this dual position grew from the problem of establishing a detailed requirement for the military characteristics desired. The Air Corps' failure to deliver a slow-flying airplane in the numbers asked by the ground forces had led the latter to resort to less satisfactory commercial models which were already in production. Because these commercial models were procured irregularly, at first on a rental basis and later in a limited, service-test quantity, the normal channels of service-test procedure were destroyed. This difficulty was further involved by the fact that the using agencies represented a number of different activities.

The tactical role conceived by the Infantry for liaison airplanes differed in many respects from that envisioned by the Armored Force. With no standardized service-test procedure established to define the desired characteristics of tactical utility, and with different tactical objectives to strive for, it is not surprising that the liaison airplane program developed in confusion.

When the Washington conference indicated that liaison airplanes would become big business, the Secretary of War pointed out that there were some 50 manufacturers of light airplanes in the United States with extensive productive capacity, but to avoid complexities of supply and maintenance, he urged that every effort be made to concentrate on a single design and type.[2] Despite this logical recommendation, it seemed

2. Exec., OCFA to AC/S, G-4, 21 Jan. 1942, in M&S, WD, Aircraft Projects Br. files, Liaison Prior 1943.

impossible to single out a design for standardization, and service tests continued to be somewhat haphazard. The 12th Observation Squadron at Fort Knox reported that the Interstate Cadet, available for testing in the North Carolina maneuvers, had been "much more satisfactory" than either the Taylor or Piper Cubs. The Fort Knox report was enthusiastic: "All pilots who flew this ship found it highly superior to any other ship of its class." On the basis of this evidence, the Experimental Engineering Section at Wright Field requested permission to procure a service-test quantity.[3]

Instructions from the Materiel Division headquarters in Washington disapproved the service-test plan and ordered a single Interstate to be tested at Wright Field by an "informal board," including representatives of the Armored Force and the Air Support Command. If the results of this test proved satisfactory, the board was to submit a recommendation for a production rather than a service-test quantity. The Experimental Engineering Section cautiously replied that a "very informal board" had approved the Interstate L-6 (sometimes called O-63) but wished to compare it with the Stinson "76" or L-5 (sometimes called O-62) in service-test quantity before putting it into production.[4]

This instance was one isolated case of many during the period of procuring and evaluating commercial models of liaison airplanes, but it is representative of the irregular and abnormal situation which prevailed

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3. T.X, EES (WF) to Tech. Exec., MD (Wash.), 9 Jan. 1942, in ATSC 452.1, Airplane, Obsn., Short Range Liaison, 1940 (C).
4. T.X, Exec. MD (Wash.) to Tech. Exec. (WF), 10 Jan. 1942; T.X, EES (WF) to Exp. Eng. Br. (Wash.), 28 Jan. and 28 Feb. 1942. In ibid. The Materiel Division at Wright Field was redesignated the Materiel Command in March 1942.

during the rush to fill the sudden demand for liaison aircraft made by the ground forces. Nevertheless, even in view of the fact that the liaison airplane program was only a small portion of the Materiel Division's procurement problems at the moment, the Experimental Engineering Section prepared specifications for an entirely new liaison airplane, a pusher type with emphasis on improved vision. The specifications were circulated to six light-airplane manufacturers, three of whom carried on advanced design studies.

The Materiel Division eventually decided not to enter into any contracts for the new type, but the foray in the field of unconventional design demonstrated the division's attitude with regard to continuing development along experimental lines.[5] Unfortunately, the rapidly expanding requirement for liaison airplanes made production appear more important than improved design, and the division had to concentrate on turning out relatively inferior and unsatisfactory airplanes in quantity rather than press the development for a superior design.

The demand for liaison airplanes grew even beyond military circles. Lend-Lease requirements, including requests from South American governments, made it evident that the light-airplane manufacturers were going to encounter an enormously increased production program. In November 1942 civilian and military agencies, whose activities required the use of light airplanes, held a meeting in Washington to coordinate 1943 requirements.

The Civil Air Patrol, engaged in 600,000 miles of coastal patrol

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5. [illegible] to MD (Wash.), 10 Jan. 1942; ICM, Brig. Gen. Chidlaw, MD (Wash.) to Tech. Exec., (MF), 24 Nov. 1942. In ibid.

each week and 40,000 miles of courier service each day, indicated a need for 200 airplanes in the L-2 class (which included L-2, L-3, and L-4), in addition to other, larger types. The Civilian Pilot Training Program, engaged in training flight instructors, liaison pilots, ferry pilots, and glider pilots, declared a requirement for 1,220 airplanes in the L-2 class in addition to other non-liaison types. The Office of the Coordinator of Inter-American Affairs anticipated a requirement for 100 airplanes of the L-2 class for Latin America, and the Army Ground Forces increased their requirement by 2,500.

The AAF air-ground support program would be satisfied by Stinson L-5 and Interstate L-6 production, but AAF Base Services expected to require 1,511 airplanes of the L-2 class. Secret operations planned by the Office of Strategic Services--presumably activities in conjunction with the underground in enemy-occupied countries--raised the L-2 class requirement by 1,700 airplanes to a total of 7,231, not including the estimated 5,000 airplanes in the non-liaison category.

On the basis of this conference, the Joint Aircraft Committee recommended that approximately 3,000 airplanes of the L-2, L-3, and L-4 types be procured by the AAF from existing facilities. The committee recommended against procurement of the 9,000-odd additional airplanes "in view of the great shortage of machine tools, materials, and labor for the existing aircraft program."

When there were no liaison airplanes at all, the ground forces had been enthusiastic about the "off-the-shelf" commercial models which the Assistant Secretary of War for Air had directed the Air Corps to procure; but when the commercial models were compared with superior types, the ground

forces became more exacting in their requirements. Throughout 1943, repeated operational accidents at Fort Sill led the Field Artillery to ground all L-2 and L-3 airplanes and request the Air Corps to replace these types with L-4's, the military equivalent of the commercial Piper.

The Field Artillery believed that the L-4, a 65-hp. airplane, was the "ultimate in simplicity" and ideally suited to artillery use. True, its take-off characteristics could be improved, but its maintenance was sufficiently simple for it to be accepted as ideal for Field Artillery operating conditions. The Air Corps, however, favored the L-5, a 185-hp. Stinson, twice as heavy as the L-4, though equipped with slots and flaps which gave it performance characteristics superior to those of the L-4. But the Field Artillery believed that these refinements were attained at the cost of increased complication in operation and maintenance. The Field Artillery considered the L-5 far too difficult to keep in repair under field conditions with "primitive equipment" and much "too hot" in the air for Field Artillery pilots.[6]

The difference of opinion between the Air Corps and the Field Artillery regarding the relative merits of the L-4 and L-5 represented the very crux of the organic observation problem. The Field Artillery wanted organic aviation elements because there seemed to be no other way to secure air observation with an Artillery point of view. But organic artillery aviation required relatively simple airplanes, easy to fly-

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6. Memo for Record by Chief, Development Eng. Br., MD, M&D, 29 Dec. 1943, in M&S, MD, Aircraft Projects Br. files, Exp. L-4, General, 6.151. For details on the problems involved in training liaison airplane maintenance personnel see "The Organization and Training of Tactical Service Units for Overseas Air Forces," Pt. II (ATSC Historical Office monograph.)

and easy to maintain. Simple airplanes could not produce the desired military characteristics, especially with regard to short take-off and landing runs.

When the Air Corps procured airplanes with superior characteristics, their complexity inevitably increased, and they became more difficult to fly and more difficult to maintain on the ground. Since production capacity had very definite limitations, it was both logical and economical for the Air Corps to want to limit production to a single type. And because all the using agencies, save the Field Artillery with organic aviation elements, were interested in superior performance rather than simplicity of design, the Air Corps had every reason to favor the L-5 over the L-4. The Field Artillery problem, however, could not be dismissed entirely and a compromise was natural.

In line with over-all AAF policy, the AAF Board recommended, in October 1943, that action be taken to reduce the number of airplane types being manufactured. Consequently, the OC&R Requirements Division, while preparing 1944 estimates for the liaison airplane program, undertook to review the entire liaison airplane series.

By the end of December 1943 there were approximately 178 L-1 (O-49) airplanes in the AAF. Although the characteristics of the L-1 type more nearly fulfilled the requirement for a liaison airplane than any other fixed-wing aircraft produced up to that time, considerations of cost, production, size, weight, and maintenance made the L-1 undesirable as a standard type. The Army Air Forces and the Army Ground Forces together had 1,496 L-2 airplanes, 1,055 L-3 airplanes, and 2,079 L-4 airplanes. Since no further requirement existed for the L-2 and L-3, those types

were recommended for classification as limited standard, while the L-4 retained the classification of standard for the Army Ground Forces.

There were 900 L-5 airplanes in the AAF at the end of 1943. Since this type was especially designed as a liaison airplane, it approached the L-1 in performance and characteristics without the attendant problems of cost, maintenance, etc. The L-5 was recommended for classification as standard for the AAF, but the L-6, of which there were 208 at the year's end, failed to live up to expectations, and, falling short of the L-5 in performance, was recommended for classification as obsolete.

There was considerable pressure in 1944 on the Director of Military Requirements to expand enormously the production of liaison airplanes. The Director wrote, in December 1943:[7]

> It is not known in this office from whence came the requirement for 12,000 airplanes which has been sent to the Joint Aircraft Committee. It is presumed, however, that it originated in the Office of Strategic Services, an organization sponsored, so far as this office can learn, by a non-military high pressure group of light plane manufacturers and private operators with strong political connections.

At any rate, the anticipated expansion did not alter the AAF estimates for 1,200 L-4 and 1,200 L-5 airplanes. Not counting 306 airplanes on L-2 and L-3 contracts from the previous year, liaison airplane deliveries for 1944 actually reached 3,265, including 1,904 L-4 airplanes and 1,361 L-5 airplanes.[8]

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7. R&R, No. 2, AFDLR to MC, 5 Dec. 1943, in MM&D, Prod. Br. files, Liaison.
8. "Aircraft, Engine, Propeller, and Glider Production," summary of Report 15 for calendar year 1944, by Aircraft Resources Control Office, Statistics Br., in ATSC Historical Office files.

Throughout 1944 the pattern of liaison airplane development continued to reflect the basic problems which had been apparent in the preceding 20-odd years. The Army Ground Forces suggested further airplane development; the Army Air Forces retorted that the introduction of new models would lead to production difficulties and increased complexities in the supply of spare parts. Moreover, the Materiel Command had introduced a series of improvements which made the L-4 more rugged than ever before. But improvements were made at the cost of performance. Increased weight increased the length of the take-off and landing run of the L-4, and this above all was the airplane's vital quality if it was to continue operating successfully in the immediate vicinity of command posts and battery positions from unprepared, cow-pasture fields.

The AAF answer to the faltering performance of the L-4 with its accretions and modifications was to suggest the L-5 with higher horsepower engines and controllable-pitch propellers.[9] This proposal, which was at variance with the Field Artillery requirement for a low-cost airplane, easy to fly and easy to maintain with primitive equipment in the field, probably helps to explain certain objections raised by the Army Ground Forces to FM 100-20, Command and Employment of Air Power.[10]

The Materiel Command may have felt in some sense well pleased in July 1944 when General Eisenhower in the European theater sent a personal wire to General Arnold asking for British Whizzers. The Whizzer was the Stinson Vigilant, an airplane very similar to the German Storch, which he declared "absolutely essential" for corps and division commanders. Since

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9. R&R, MD to Requirements Div., 8 May 1944, in M&S, MD, Aircraft Projects Br. files, 6.151, Exp. L-4, General.
10. See n. 36, Chap. VII.

the Vigilant was substantially the same airplane as the O-49 or L-1, which the Materiel Command had originally procured for the very purpose General Eisenhower had in mind, the Materiel Command might have been inclined to consider the job well done. On the other hand, General Eisenhower, in referring to the British Whizzer rather than to the equivalent L-1, may have implied that the AAF failed to provide the airplane which the ground forces wanted.

When General Eisenhower's request reached Washington, the L-1 was already long out of production and branded "obsolete." Despite the general's specific objections to the L-4 and L-5 as too slow at take-off and unable to descend fast enough for reasonable safety when attacked by hostile intruders, the AAF intended to improve the L-5 with a controllable-pitch propeller, giving it characteristics comparable to the L-1.[11] Clearly, there could be no definitive solution to the problem of AGF requirement and AAF development, but systematizing and formalizing the means of determining tactically useful performance characteristics would go along way toward simplifying the procurement of airplanes attaining the desired objectives.

While the Requirements Division hoped to approach L-1 performance by using an L-5 with controllable-pitch propeller, requests from the India-Burma sector pressed for the L-1 or the L-5, with as many of the former's characteristics as possible, to use in removing litter patients

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11. TWX, Gen. D. D. Eisenhower to Gen. H. H. Arnold (Personal), 6 July 1944 (S); TDM, Col. Bradbury to Maj. Nicholson (M&D), 13 July 1944. In M&S, HD, Aircraft Projects Br. files, 6.112, Production, General, Liaison.

from restricted jungle areas and dropping supplies from bomb shackle mounts to isolated garrisons.[12]

From the care area care reports of helicopters operating 150 miles deep in enemy territory, rescuing pilot casualties in areas where Japanese patrols and air surveillance made it impossible to prepare even small strips for conventional liaisons.[13] The evidence is hard to ignore. The peacetime argument that the vulnerability of unarmed, light airplanes would make their use impossible was proved absolutely wrong. Combat experience, as summarized in an AAF Regulation on liaison aircraft in November 1944, had demonstrated the fallibility of dogmatic assertions on the worth of light airplanes. Artillery adjustment, reconnaissance and light photographic observation, troop and light-cargo transport, aerial evacuation, column control on the march, camouflage checking and wire laying for communications--these and a dozen other command, liaison, utility, and courier functions, "consistent with the limitations of liaison aircraft," were designated as the mission of the unarmed airplane.[14]

The fears of those who argued the excessive vulnerability of the unarmed liaison airplane were probably demolished more effectively by the following Associated Press news item of April 1943 than by any other means:[15]

WEST FRONT TALES

> With the U.S. Seventh Army - (AP) - The Third Infantry Division with its proud record of 22 Congressional Medals of Honor regards itself as one of the toughest outfits in any army. . . .

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12. Memo for Col. Berquist by Chief, Requirements Div., OC&R, 10 July 1944, in ibid. See also TWX, CG AAF, India-Burma Sector to WD, 12 April 1944, in L&S, WD, Aircraft Projects Br. files, 6.162, Production, L-5, General.
13. Memo for Col. J. F. Phillips by Col. S. B. Brentnall, 4 July 1944, in ibid.
14. AAF Reg. 35-27, 29 Nov. 1944.
15. Dayton (Ohio) Journal, 21 April 1945.

In a recent battle, "Iron Mike" O'Daniel [Maj. Gen. John W. O'Daniel, the division commander] watched from a cub plane while a company took one position but hesitated to move forward without reconnaissance. The General's plane swooped low. He dropped a note saying, "No Boche for two kilometers. Get moving." The company moved.

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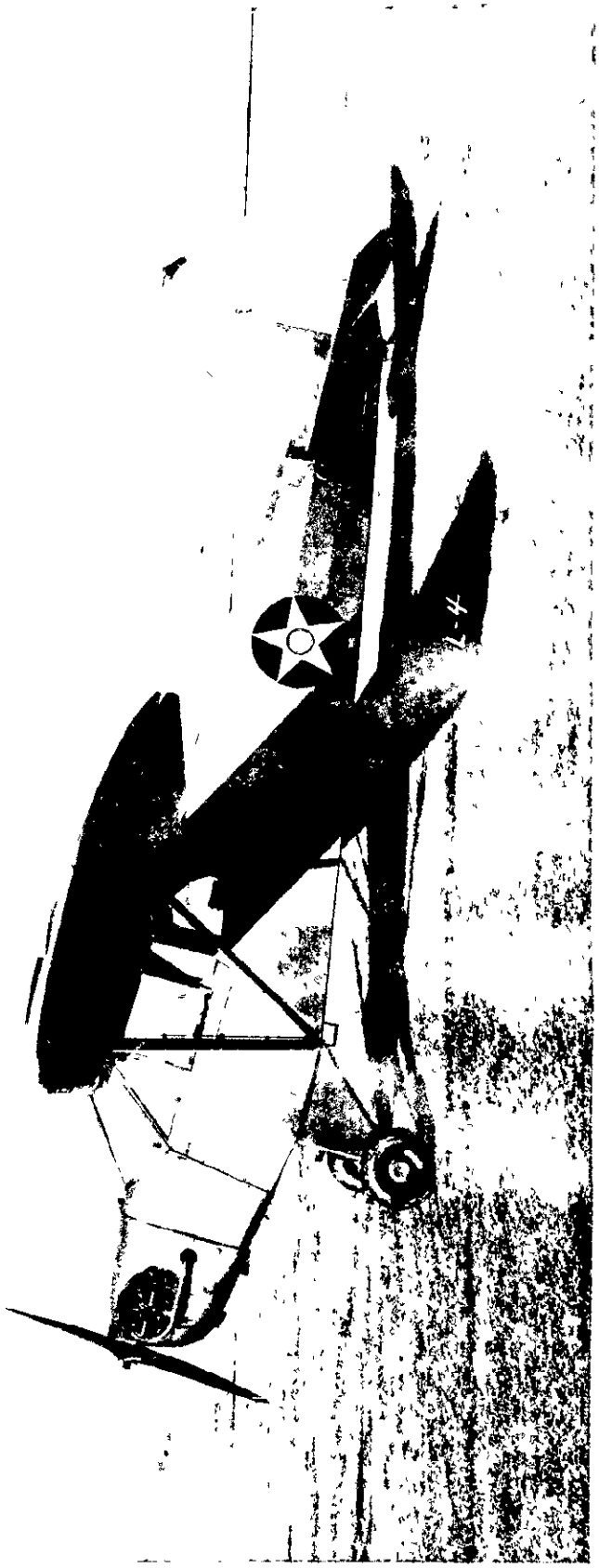

Chapter IX

SUMMARY

The evolution of the liaison airplane is of peculiar interest to the Army Air Forces because the type represents a cross section of problems involving both air and ground arm functions. From the summary of the liaison airplane in evolution, it is possible to extract some valuable lessons in the form of tentative conclusions.

The development of military airplanes during the 1920's was hampered by the paucity of tactical studies based on World War I experience. Those accounts of aerial combat which were available were found to contain a disproportionate element of subjective opinion.

Not only were the analytical studies on airplane tactics few and therefore of limited utility at the end of World War I, but the machinery for evaluating those studies, the organization for converting tactical requirements into engineering facts, was never perfected. The remarkable system which had been organized at McCook Field during that war fell apart in a matter of weeks after the Armistice.[1]

The heritage of World War I was unfortunate in that it seemed to stress airplanes rather than principles. The engineers who were confronted with the task of designing airplanes for observation were advised

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1. See AISC Central files, 1918-1919 McCook 314.7, Histories, for evidence of the rapid organizational decay at McCook Field after the Armistice.

to build two- or three-place biplanes with fixed forward guns and flexible rear-firing guns. In short, the engineers inherited airplanes to improve rather than objectives to strive for. They were given a tradition, a complex of opinions and prejudices, as well as a body of experience. They were not given a series of tactical functions around which to build the best airplane possible.

The danger in attempting to develop an airplane, that is, perfecting a trend rather than building directly toward the most adequate solution of the tactical functions desired, was especially significant in the case of the liaison airplane. World War I presented a highly specialized tactical situation. Throughout the greater part of the war the opposing sides operated from behind relatively stabilized lines from prepared airdromes. The airplane that was developed for observation and liaison purposes was the answer to that specific situation; it was a highly specialized instrument designed for a specific role.

The mistake of the Air Corps lay in the failure to identify the observation airplane of 1918 as a specialized weapon. The most convincing proof of this mistake appeared in 1940, when, after the first few months of warfare in Europe, the corps and division airplane disappeared. The Air Corps had backed the wrong horse for 20 years. There may be some consolation in the fact that other nations had made the same error.

Another lesson inherent in the evolution of liaison airplanes seems to point to the importance of large-scale maneuvers under field conditions. Undoubtedly a large measure of the failure to develop corps and division observation airplanes to meet the ultimate tactical

role lay in the fact that maneuvers, limited as they were down to 1940, were utterly lacking in realism. Observation squadrons supporting "opposing" armies from the same airdrome probably represent the apogee of absurdity, but even the best efforts of the Air Corps would probably be destined to fail until the opposing armies represented at least corps-sized groups of ground troops.

Inadequate and unrealistic air-ground maneuvers delayed the development of corps and division airplanes. This delay induced the Field Artillery to ask for organic aviation, which in turn forced the Air Corps to interrupt its normal technical development and improvement to continue production on airplanes simple enough for ground-arm operation. Without maneuvers, the air and ground arms could not grow together normally throughout the years, and inevitably the sudden expansion induced by the war emergency brought acute growing pains, organizational problems, and design difficulties.

The Air Corps probably unconsciously neglected to theorize on its tactical role in struggling to obtain recognition for the potential strategic role of aviation, but even if the emphasis of interest was placed on strategic weapons, the sizable number of "observation" airplanes produced in the between-war years certainly indicates that the tactical role was not slighted. There were many more observation airplanes than bombers down to the outbreak of World War II.

The case of the liaison aircraft suggests the utility of theorizing on the objectives desired when establishing military characteristics for a new-type airplane. The handbooks on observation aviation prepared at the Tactical School went on year after year reprinting the same old

truisms, which apparently did not even reflect more than a very limited survey of the available tactical studies from World War I. Tactical School theory influenced the boards and individuals who were responsible for establishing the performance characteristics desired, and lack of theorizing led to stagnation in design.

The extent to which this stagnation could be carried is interestingly illustrated by the case of the slow-flying airplane. The United States perfected a slow airplane in the Guggenheim Safe Plane competition, but the failure to speculate on its potential military use left the development of liaison aircraft to continue on its traditional course until the German Storch appeared to make its profound impression.

The dangers inherent in a relatively unquestioning acceptance of existing doctrine are clearly apparent in the contradictions found in the discussion of liaison airplanes on the one hand and observation-balloon policy on the other. While the Air Corps continued to accept the ungainly and helpless kite balloon with its obvious exposure to enemy action, it raised the most serious objections to the unarmed, light airplane because of its complete vulnerability. Inconsistencies of this sort seem to indicate a failure to carry the theoretical approach, in preparing military characteristics for a type, to a logical conclusion.

The importance of clear reasoning and a thoroughly systematic approach to the problem of compiling type characteristics is illustrated by the reports of military attachés in foreign capitals. As individuals, military attachés are bound to suffer from the same subjective limitations which hinder those who write tactical résumés, but taken collectively, the information gathered by the attachés probably represents a most vital source of information. German development of the Storch was

extremely influential in altering the Air Corps trend of design and tactical concept. The several attachés, as well as the NACA European technical assistant who reported on the Storch, secured sufficient information about the new airplane and its use to lead to the conclusions which were ultimately reached in the United States, but the evidence suggests that the individuals primarily concerned with military-type characteristics made comparatively little immediate use of the attaché and NACA reports.

The entire development program of liaison airplanes, dealing as it does with an exceptionally difficult problem of coordinating functional requirements with the ground arms, revealed one conclusion above any others. If the tactical objectives, the functions which an airplane is going to be called upon to perform, are hazy, the engineering objectives will be obscure. Unless the tactical objectives are clearly defined and accessible to those who compile type characteristics, there can be no adequate objectives for design, for technical and engineering advance. If the AAF is to avoid repeating the mistake of the corps and division observation airplane, it would do well to perfect the system of evolving military characteristics for types and to rationalize the method of obtaining tactical-performance data both at the service-test and combat level until tactical characteristics can be expressed almost as accurately and as definitively as technical characteristics.

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G L O S S A R Y

AC/S	Assistant Chief of Staff
AC/AS	Assistant Chief of Air Staff
AFCC	Air Force Combat Command
AFDMR	Director of Military Requirements
AGO	Adjutant General's Office
AR	Army Regulation
AS	Air Service
(C.)	Confidential
C/AC	Chief of the Air Corps
C/AS	Chief of Air Service
CF	Central Files
C.P.	Circular Proposal
Dir.	Director
EES	Experimental Engineering Section
Eng.	Engineering
Exec.	Executive
Exp.	Experimental
FA	Field Artillery
FM	Field Manual
FSS	Field Services Section
FY	Fiscal Year
Hist. Div.	Historical Division
Ind.	Indorsement
Info. Div.	Information Division
Inst.	Institute
ICM	Inter-Office Memo
MMS	AC/AS Materiel and Services
MC	Materiel Command
MD	Materiel Division
Mat. Cent.	Materiel Center
MID	Military Intelligence Division
MMMD	AC/AS Materiel, Maintenance and Distribution
NACA	National Advisory Committee for Aeronautics

Obsn.	Observation
OC	Office of the Chief
OCAC	Office of the Chief of the Air Corps
OCFA	Office of the Chief of the Field Artillery
OC&R	Operations, Commitments and Requirements
ONI	Office of Naval Intelligence
Ord.	Ordnance
Procur.	Procurement
Prod.	Production
Recn.	Reconnaissance
(S.)	Secret
Sec.	Section
Spec.	Specification
S/W	Secretary of War
TAG	The Adjutant General
Tech.	Technical
TR	Training Regulation
TWX	Teletypewriter Exchange Message
USMC	United States Marine Corps
WDGS	War Department General Staff
WF	Wright Field

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Of the large number of sources consulted in the preparation of this monograph, the most useful were the Wright Field Tech Data Library document collection, especially valuable in surveying the scanty literature of World War I tactical studies, and the Wright Field Central Files, for extremely extensive coverage in procurement correspondence and board reports as well as fiscal and engineering reports. The Aircraft Laboratory's files proved surprisingly unrewarding.

In Washington, the OCAC Information Division files in the AAF Historical Office supplemented the Wright Field Tech Data Library's military attaché report collection. Likewise, the files of the OCAC Plans Division contained some valuable items. The Pentagon library, apart from the AAF document collection containing numerous items from the Tactical School, was most useful as a source for back numbers of military service publications of France, Great Britain, and the United States.

The AAF Classified Central Files contained many items of exceptional importance in rounding out Wright Field sources, particularly the notes of headquarters conferences with ground arms representatives. The Unclassified Central Files contained little material substantially different from Wright Field coverage.

The AGO Classified Records Section, bulk files, contained a few items of interest in both air force and General Staff (G-4) files, but neither offered materials significant enough to alter or modify any conclusions that might have been drawn from evidence secured in other repositories. The AGO Publications Branch was useful for its file of superseded field manuals, technical manuals, etc.

The Aircraft Project Branch files (in the Materiel Division of Assistant Chief of Air Staff, Materiel and Services) were very useful in supplementing the "Liaison Aircraft Program" Case History, on file at the Air Technical Service Command Historical Office, on the production and expanding requirements phase of liaison airplanes.

The most important single source of information on liaison airplanes, particularly in the period 1941-1944, was the Case History "Liaison Aircraft Program," prepared in the Historical Office, ATSC, in January 1945. The Case History consists of four sections, a document facsimile file, a digest of the documents, a statistical compilation with photographic illustrations, and a narrative summary of the experimental development and initial procurement phase of this project. Documents for the Case History were extracted from all the important Wright Field and AAF Air Staff office files concerned with the project.

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